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HOT CoCo

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NOVEMBER 1985
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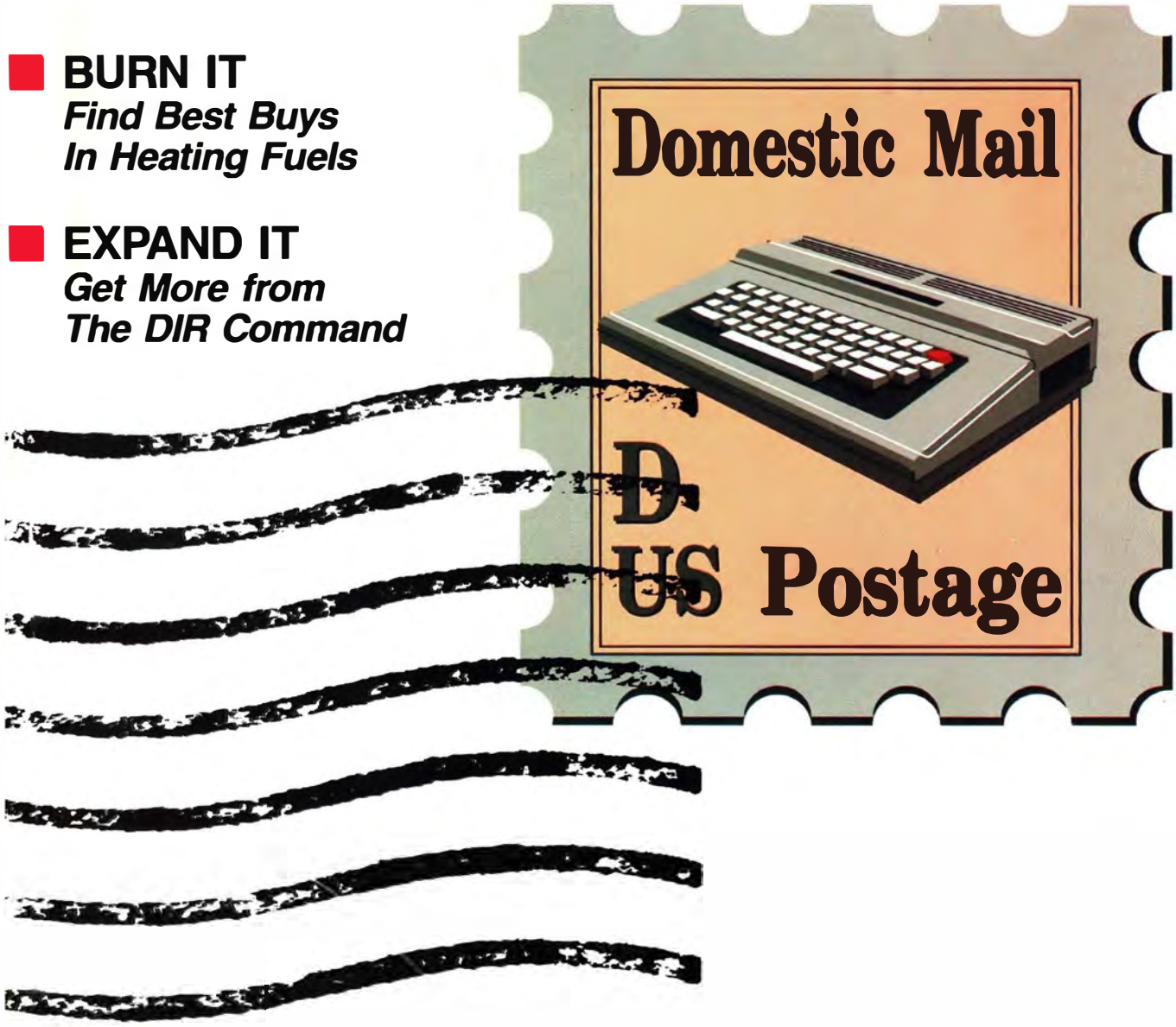

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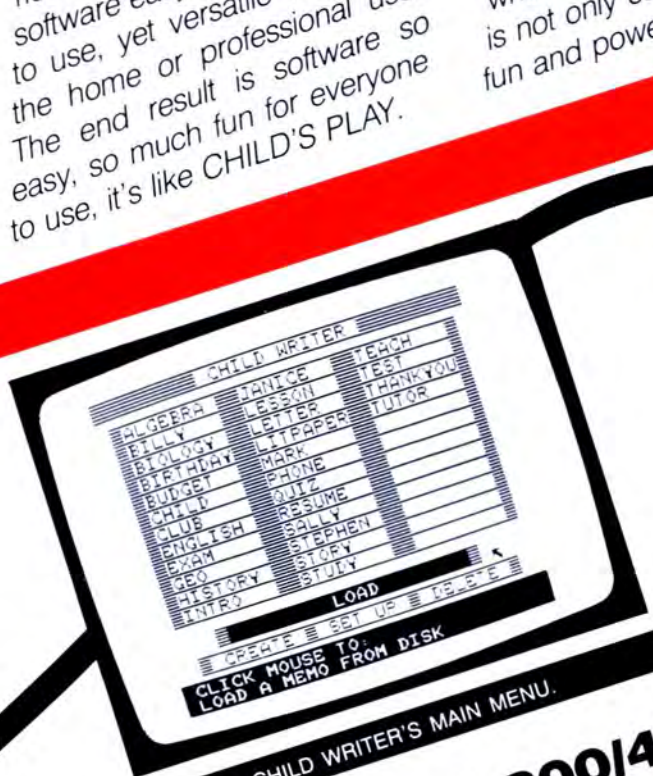

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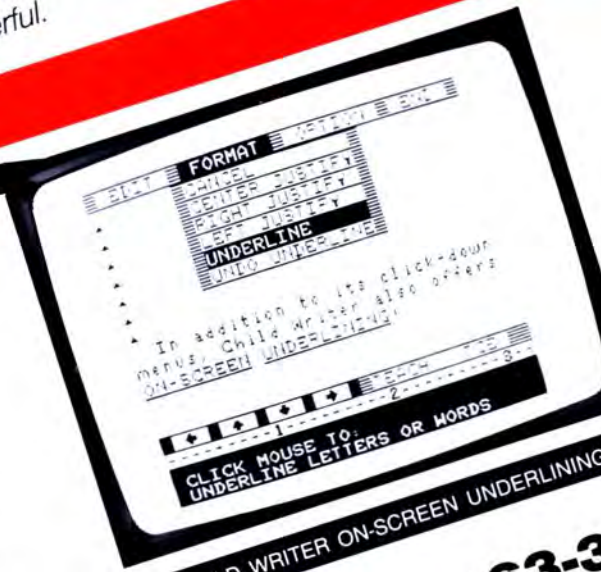

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TECHNOLOGY

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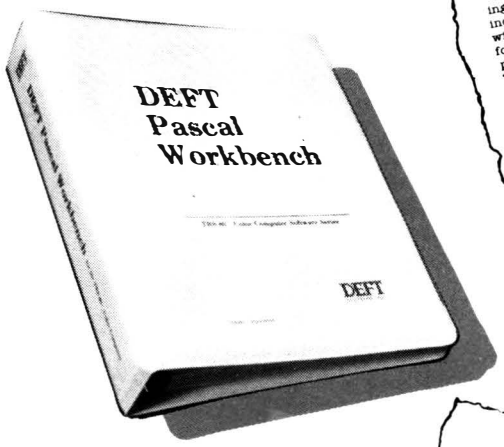

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HOT CoCo Magazine - (March 1985)

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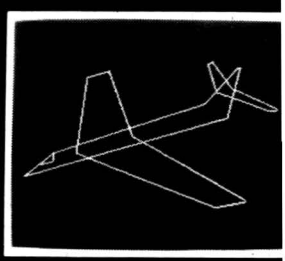

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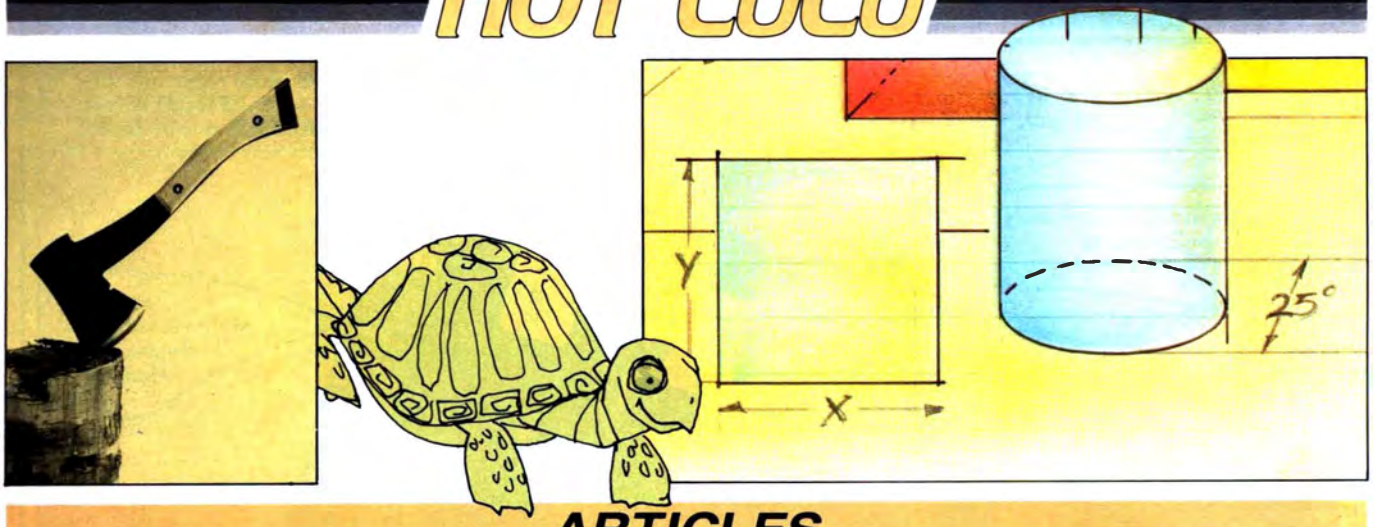
HOT CoCo

Vol. 3 No. 6 November 1985



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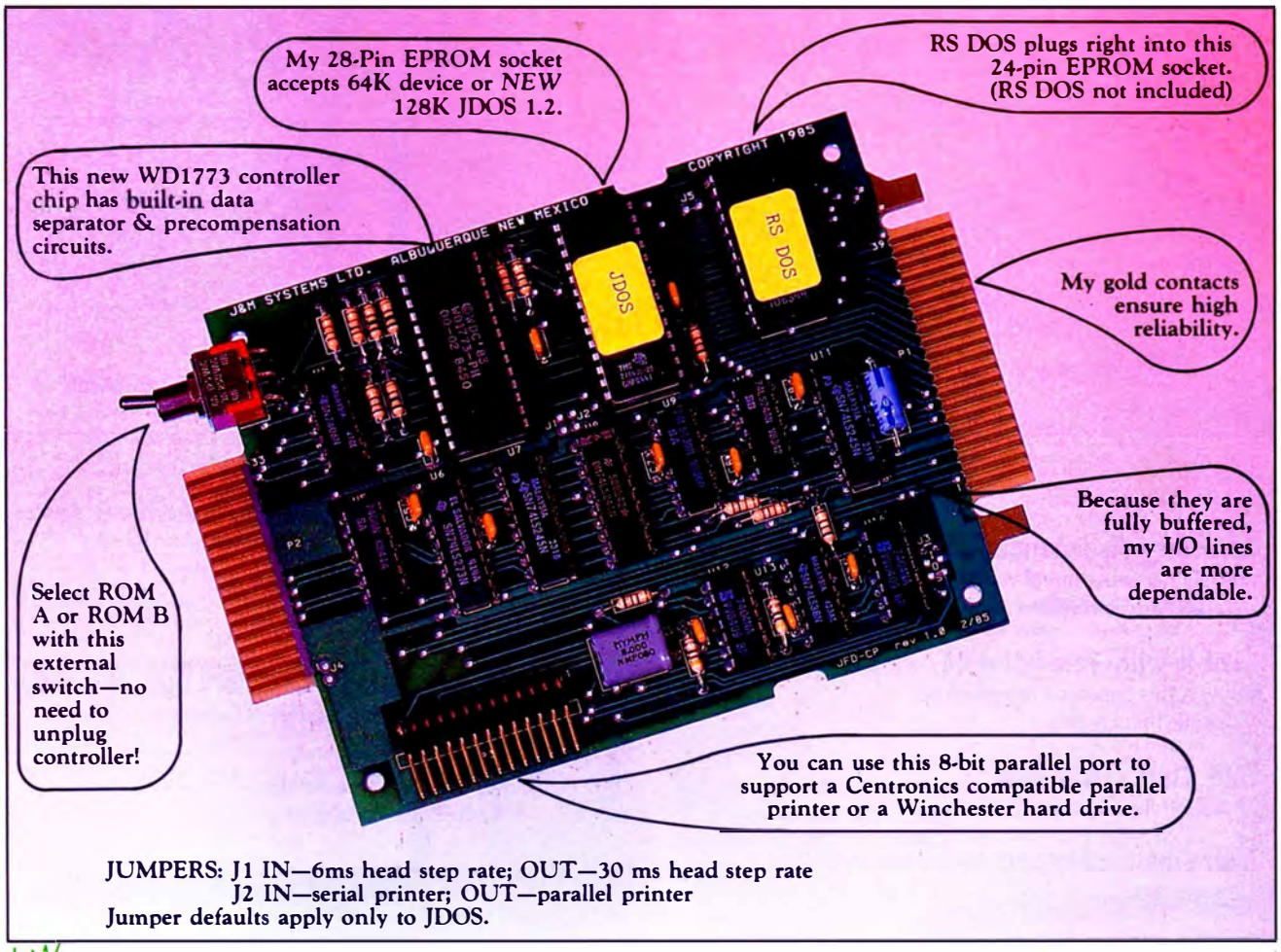
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Digressions

Random Thoughts

In my June 1984 Digressions, I called upon software authors to develop more serious software for the CoCo, such as a Lotus 1-2-3-like integrated package and a true relational database manager. It now appears that these two products will soon be available. (See this month's Product News for more information.)

The announcement of these products is an encouraging sign. It shows that the better software authors are still developing state-of-the-art programs for the CoCo. The CoCo needs products such as these to maintain its user base in the face of new competition (Commodore 128 and Amiga, Atari 520ST, and souped-up Apple //s). As long as there are companies willing to try to squeeze more function from the Color Computer with new products, the CoCo market will remain healthy.

Speaking of Atari

The new Atari 520ST is available now, as many of you are probably aware. It looks like a great deal: $799 for a 512K computer with monochrome monitor, 3.5-inch disk drive, mouse, and Atari Logo. Can it be too good to be true? Consider this: There is virtually no software base for the new Atari. At the present time, only a software developer would find a serious use for the 520ST.

If it breaks, where do you go to get it fixed? I called Atari to find a dealer near me. They didn't have any in my area, but they did give me the phone number of a sales representative in a neighboring state. My nearest Radio Shack dealer is 6 miles away. Finally, Atari admits that it is having problems with the 520ST's operating system, TOS (Tramiel Operating System, named after Atari chief Jack Tramiel), which is why it comes on a separate disk instead of on ROM. Early buyers should therefore expect to play guinea pig.

I'm not going to worry about the 520ST as serious competition for the CoCo yet. Tramiel and company must sort out the computer's problems, establish a decent dealer network, and get some serious software to market. The Color Computer has at least a five-year head start.—*Michael E. Nadeau*

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Instant CoCo is a cassette tape containing the major programs from this issue of *HOT CoCo*. Its purpose is to save you the time and effort of typing long program listings into your Color Computer. You simply load the programs from the Instant CoCo tape using your cassette recorder. The instructions for operating each program are found in the corresponding *HOT CoCo* article. Both Basic and Assembly-language programs are included on the tape.

The Instant CoCo symbol appears in *HOT CoCo*'s table of contents and on the program listing for each article with a listing used on the Instant CoCo tape. As an added extra, each tape also contains a never-before-published Bonus Program, complete with instructions.

The directory below lists all programs included on this month's Instant CoCo cassette. Shown first are the name of the article with a descriptive blurb and its author, followed by the page number in this issue where the article appears. Next comes the file name of the program on cassette. Finally, there is a brief description of the Color Computer system needed to run the program.

This month's Instant CoCo cassette is available for just $11.47, including postage and handling, from **Instant CoCo, 80 Pine St., Peterborough, NH 03458.** See our ad on p. 64 for more details.

Instant CoCo Directory November 1985

Side A

Article Name/Author/Description	Page #	File Name	System
Copyright Statement	---	TITLE	16K CB
Mindbusters/Ramella Leave the perimeter in just the right number of moves.	14	WILDBLUE	16K CB
Directory Assistance/Bonnell Put an end to cryptic disk-directory screens.	30	FSDIR	32K DECB
Mail It with Telewriter-64/German Give Telewriter mail-list sorting capabilities.	34	TWSORT	16K DECB
Halt Thief/Jense Listen to the clues to find the crook before your opponents.	37	HALTHIEF	32K ECB
Mathematics Helper/McArthur Solve difficult geometric equations.	45	MATHHELP	16K ECB
Finding Firewood Best Buys/Baker Calculate how to stay warm this winter at the least cost.	48	FIREWOOD	16K ECB

Side B

Math Invasion/Clift You must solve a math problem before you can save the world.	53	INVASION	16K ECB or 32K DECB
Linked Lists/Bauder Learn another way to sort data.	63	LINKSORT	16K CB
Tame Your Reset Button/Gault Reset Basic programs to the point you, not the CoCo, wants.	68	LISTING2 RESET(m)	16K ECB 16K CB
Teacher Helpers/Wood Generate true/false tests.	70	LISTING3	16K ECB

*****Bonus Program*****

Megashield/Washington You've got to be quick and a good shot in this Assembly-language arcade game.	---	MEGASHLD(m)	16K ECB

CB = Color Basic, DECB = Disk Extended Color Basic, ECB = Extended Color Basic, (m)—achine-language program (use CLOADM)

Back Issues

Yes, back issues of *HOT CoCo* are available for al months. This list shows the features in each issue:

October 1983—Animation techniques; ROM dis assembly, part I.

November 1983—Nuclear submarine simulation ROM-pack primer; banner printer.

December 1983—World capitals quiz program talking spelling tutor; vocabulary-building program.

April 1984—Peripherals buyer's guide; how t shop for a disk drive; disk-fix utility; Lisp inter preter.

May 1984—OS-9 review; financial transactions tracker; homebrew spelling checker; CoCo Reversi game.

June 1984—Horse-racing and stock-market simulators.

July 1984—Do-it-yourself lowercase mod; variable cross-referencer; the game, Python.

August 1984—Basic OS-9 review; database manager program; graphics tutorials; hurricane tracker.

September 1984—Educational software buyer's guide; typing-teacher program; the CoCo as a marketing aid.

November 1984—Personal money manager program; disk-file protection utility.

December 1984—Disk-drive timer; disk drive maintenance tips; full-featured text-editing program.

January 1985—Spreadsheet program; stock-charting program; make fancy graphics with your printer.

February 1985—Drawing program; user's group list; Space Hawks game.

March 1985—Universal screen-dump program; POKE list; utilities.

April 1985—Telewriter-64 mods; modem comparison; satellite-tracking program.

May 1985—Sound digitization; blackjack program; disk-based smart terminal programs compared.

June 1985—How to install 64K in any CoCo; pie-chart program; custom fonts for Gemini printers.

August 1985—Graphics utilities; auto-line-numbering program; how to connect the CoCo to a Model 100.

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How to Use HOT CoCo

Each month *HOT CoCo* provides a number of program listings for you to type into your Color Computer and use. If you are new to computing, read this page for advice that will help you avoid problems often encountered when entering programs manually.

Know the Basics

Before you begin, you should be familiar with the basic operation of your Color Computer. Read the manual, and make sure you understand how to enter a program line, save a program to cassette or disk, and make corrections to a program line. Verify that the program you want to enter will run on your version of the Color Computer. You need to know the memory requirements, the type of Basic used (Color, Micro Color, Extended Color, or Disk Extended Color Basic), what peripherals might be needed, and in some cases whether a particular ROM version is needed.

All this information is provided in the System Requirements box included with each article that has a program listing. This box gives the minimum requirements to use the program. If, for instance, the box reads "16K RAM, Color Basic," the program should also work on 32K or higher, Extended or Disk Extended Color Basic CoCos. Optional equipment is listed as such. Once you've established that the program will work on your CoCo, read the article thoroughly. Sometimes it will include information vital to typing in the listing.

What You See Is What You Get

We print all Basic program listings 32 characters across—just as they appear on your video screen. Type in the listing exactly as it appears in the magazine, being particularly careful with spaces and punctuation. If you do this, the 32-character format will aid in proofreading what you have typed by letting you match beginning and ending characters on corresponding lines. If you have a line that ends on a character other than what appears in the magazine, go back and check for a typo. Also, don't mistake certain characters for others that look similar, such as a zero instead of the letter O, a comma for a semicolon, and so on.

Weird Characters

The up arrow indicates exponentiation on the Color Computer. Unfortunately, our printer prints a caret (^) instead. Be sure to type an up arrow in place of all carets in Basic program listings.

Assembly-Language Listings

HOT CoCo often publishes programs written in Assembly language rather than Basic. Assembly programs "talk" to your CoCo on a more direct level and, therefore, run faster. Unfortunately, it is much more difficult to learn Assembly-language programming than Basic programming.

But you do not need to know how to program in Assembly to use these programs. You do need, however, something called an editor/assembler. An editor/assembler allows you to manually enter an Assembly listing, and then it "assembles" it into a form that your CoCo can execute.

If you do not own an editor/assembler, it is possible to hand-assemble an Assembly listing, but this is a tedious process that is best left to someone with a little experience with Assembly programming. It also requires a short Basic routine that prepares your CoCo for hand-assembly.

We try to convert Assembly programs to Basic DATA statements. With a short Basic routine to execute the DATA statements, you have a program that you can type in just like a Basic listing, yet operates much like the one written in Assembly.

If you want one of *HOT CoCo*'s Assembly listings, but it hasn't been converted to DATA statements and you do not own an editor/assembler, check to see if it appears on our Instant CoCo cassette. All assembly programs on Instant CoCo are in assembled form, meaning you can load and execute them immediately.

Speaking of DATA Statements

Since DATA statements often consist of numbers only, it is easy to make a mistake typing them in. One wrong number can crash the program. When this happens, the only way to recover is often to turn off the computer for a few seconds before turning it back on. Of course, this wipes out your program in memory.

To avoid this, always save what you have typed in before running it. That way, if you did make a mistake, you can load the program from tape or disk to look for the error, rather than retyping the entire listing.

One last thing about DATA statements: Error messages that occur due to a mistyped DATA statement line will refer to the corresponding READ statement line earlier in the program. Yet it is the DATA statement that is incorrect.

If All Else Fails

If you cannot get your typed-in listing to run after checking and double-checking for typos, you can ask us for help. Send a detailed description of your problem along with any error messages given. Ideally we'd like a printout of what you typed. Send a self-addressed, stamped envelope for the fastest reply. Sorry, but we cannot help you if you have modified the original program in any way. Write to ***HOT CoCo*, attn. Technical Editor, 80 Pine St., Peterborough, NH 03458.■**

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Letters to the Editor

Out of Tune

In your review of CoCo Tuner (*HOT CoCo*, August 1985, p. 74) you state that the instrument "emits an audio signal in which A equals 220Hz—octave 4 on the piano, or the A above middle C." The frequency for the A below middle C is 220 Hz; 440 is the frequency for the A above middle C.

Furthermore, the Hale Sight-O-Tuner was not mentioned as one of the "electronic tuning forks." The product is sold by Tuners Supply Co., P.O. Box 950, Somerville, MA 02145.

Of course, it takes more than knowing the correct frequency in order to finely tune a piano. The tuner "hears" only the vibrations produced between bridges, making no allowance for equalizing the tension of the strings across the bearing points or taking the twist out of the tuning pins after they have been moved.

Bob Buzzell
Newtown, PA

Our apologies for the error and the oversight.—eds.

Program for Diabetics

I am interested in developing a program for educating young diabetics and have heard that programs of this type are already available. Could anyone provide information on obtaining such a program for the CoCo? I am eager to hear from other CoCo users with a similar interest.

Miss Wendy Ross
50 Sandwich Road
Beckenham, Christchurch 2
New Zealand

CoCo Connection

I'm looking for an interface (with cable) to connect my 32K CoCo to a Brother Compactronic 60 typewriter that is said to be computer compatible. I would appreciate advice on making the connection and the address of an interface manufacturer.

Norman A. Bleshman
165 Ames Ave.
Bergenfield, NJ 07621

Hi-Res World Map

Readers who want to use World Map (*HOT CoCo*, April 1985, p. 30) in PMODE 4, the highest resolution mode, are hampered because the identification circle does not appear on land masses. The modification below draws the portion of the circle over water in black and the portion over land in white. Edit line 30 as shown and add the other four lines.

```
 30 PMODE4,1:PCLEAR4:PCLS:CLS
265 FOR TH = 0 TO 6.3 STEP .3
270 XC = XP + 5*COS(TH):YC = YP +
    5*SIN(TH)
275 IF PPOINT(XC,YC) = 5 THEN PSET
    (XC,YC,0) ELSE PSET(XC,YC,5)
276 NEXT TH
```

The changes replace the CIRCLE command by PSETing each pixel around the perimeter of the circle after determining whether it should be white or black.

World Map is a great educational program.

R. Spencer Soanes
Brechin, Ontario

Program Correction

The Listings accompanying David Meredith's article, "All Sorts of Sorts" (HOT CoCo, July 1985, pp. 46 and 47) contained minor errors. Replace the first greater than symbol (>) in line 220 of Listing 5 with a colon (:). In line 180 of Listing 7, change the beginning of the line to read: IF V = A(I + 1).—eds.

Redesign

It is impossible to use a slow screen dump from screen 0 in Designmaker (*HOT CoCo*, August 1985, p. 26). To accomplish this, edit line 1260:

```
1260 IF PPOINT(ZX,ZY) = F*4 + 1 THEN
     1320
```

There is one small error in the article. The System Requirements for Designmaker should state that it requires 16K RAM.

Thad Starner

Modem II Revisited

Despite my response to Jason Johnson's letter published here in July, HOT CoCo has received additional mail criticizing the review of Tandy's Modem II (HOT CoCo, April 1985, p. 24). The review, which was designed to be an examination of low-cost modems, included a cursory inspection of the higher priced Modem II because many readers might consider the Tandy product, as well.

Most of the Modem II's features work fine on the Color Computer. However, the device does not perform autodial operations with all Color Computer software. In addition, the CoCo cannot monitor the carrier-detect line in the autoanswer mode unless you run a special line into the joystick port or use Tandy's Deluxe RS-232 Program Pak (catalog no. 26-2226). The Program Pak, which sells for $59.95, was not available for the review. It will provide access to more control lines for maintaining control of the modem.

Another problem with the Modem II concerns its force DTR (data-terminal ready) switch. Turning this switch on when you are running a BBS always forces a carrier detect; consequently you can't determine if a caller has hung up. Instead, you must rely on a software time-out to make the disconnection. If you add Tandy's RS-232 ROM pack and leave the force DTR line off, carrier-detect is not forced and can be monitored. However, the force DTR switch is a flaw and a major problem for BBS owners. For autoanswer, I find many better modems on the market.

Use of the Modem II as an autodial modem is dependent on your software. The review should have stated more clearly that the autodial feature works with some, but not all, terminal packages. But the fact that some readers have found programs that perform this function on the Modem II (including Autoterm from PXE Computing and Vidtex from CompuServe) does not mean that the product will work universally. Several packages will not autodial with the Modem II.

Bobby Ballard

MC-10 User

I own an MC-10 with 20K RAM and CCR-81 and CGP-220 printers. I would appreciate hearing from anyone who can offer advice on a few specific programming, hardware, and software problems.

First of all, can anyone tell me whether you can change the rectangular cursor, using one or more of the ASCII characters in the VDG instead? Or can you provide assistance with my robot and speech synthesis projects? I am looking for 25 inexpensive stepper motors and information on interfaces and programming for the robot. I would welcome tips for using Tandy's SP0256A-AL2 speech-synthesis IC with the MC-10.

I'd like to obtain a circuit-design program that prints text and graphics to the screen and printer and that also allows you to save and load designs to and from cassette. My final request is for a music program comparable to Tandy's Audio Spectrum Analyzer (catalog no. 26-3156).

Arne J. Gregor
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Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Black	Buff/Black	Buff/Black
X,Y Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L.keys	Clear key	No
16/32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
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Switch to & from the Standard 16 by 32 Screen for full compatability	Yes	No	No
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CBASIC is FAST. Not only will CBASIC compiled programs execute 10 to 1000 times faster than Basic, but the time it takes to develop a CBASIC program versus writing a machine language program is much, much shorter. A machine language program that might take several months to write and debug could be created using CBASIC in a matter of days or hours, even for a well experienced machine language programmer. We had a report from a CBASIC user that claimed "a Basic program that used to take 3 hours to run, now runs in 7 to 8 minutes". Another user reported a program that took 1 to 1½ hours to run in Basic, now runs in 5 to 6 minutes!!!

MORE THAN JUST A COMPILER

CBASIC has its own completely integrated Basic Program Editor. The Editor contained in CBASIC is used to Create and/or Edit programs for the compiler. It is a full featured editor with functions designed specifically for writing and editing Basic programs. It has built-in block Move and Copy functions with automatic program renumbering. Complete, easy to use inserting, deleting, extending and overtyping of existing program lines. It is also used for Loading, Saving, Appending (merging), Killing disk files and displaying a Disk Directory. It also has automatic line number generation for use when creating programs or inserting sequencial lines between existing lines. You can set the printer baud rate and direct normal or compiled listings to the printer for hard copy. The built-in editor makes program corrections and changes as easy as "falling off a log". If CBASIC finds an error when compiling, it points to the place in the program line where the error occurred. All you have to do is tell the editor what line you want to start editing and when it is displayed, move the cursor with the arrow keys to the place where the error is and correct it. Just like that, it's simple.

HI-RES & 80 COLUMN DISPLAYS

CBASIC is the only Color Basic Compiler that includes its own Hi Resolution 51, 64 or 85 by 24 line display. It is also the only compiler that supports both the PBJ "Word Pak" and the Double Density 80 column cards. All of these display formats are part of the standard CBASIC compiler package. Not only can these display formats be used for normal program editing and compiling, but CBASIC will also include them in your compiled programs! If you want CBASIC to include the display driver in your program, all you have to do is use a single CBASIC command "HIRES". The run time display driver that CBASIC includes in your program is not just a simple display, but a full featured display package. With the Hi Resolution display package you can mix text & graphics, change characters per line, underline, character highlight, erase to end of line or screen, home cursor, home & clear screen, protect screen lines, and much more. All commands are compatible with our HI-RES II Screen Commander so you can easily develop screen layouts using HI-RES and Color Basic before you compile your program. The same applies to using the 80 column card drivers. What other Basic compiler offers you this kind of flexibility?

64K RAM SUPPORT

CBASIC makes full use of the power and flexibility of the 6883 SAM (Synchronous Address Multiplexer) in the Color Computer. It will fully utilize the 96K of address space available in the Color Computer (64K installed) during program Creation, Editing and Compilation. CBASIC has a special command for automatic 64K RAM control. When used in a program, it allows the user to use the upper 32K of RAM space automatically for variables or even program storage at run time. It will automatically switch the ROMs in and out when needed. There are also two other commands that allow you to control the upper 32K of RAM manually, under program control. No other Color Basic compiler directly supports the use of 64K RAM like CBASIC.

ALL MACHINE LANGUAGE

CBASIC is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC can edit and compile very large programs. Even using the Hi Resolution 51 by 24 line display, it can work with about a 34K program, and the 80 column card versions can handle almost 40K of program. Some of the other Basic compilers can only work with 16K or about 200 lines. Even working with large programs, CBASIC compiles programs with lightning fast speed. It will compile a 24K program to disk in less than 2 minutes! That's without a listing being generated. We've heard stories about some other compilers that take almost 10 minutes to compile a simple 2-3K program. You might inquire about this when you look at some of the other compilers available.

THE FINISHED PRODUCT

Since CBASIC contains statements to support ALL of the I/O devices (Disk, Tape, Screen & Printer), Hi-Res Graphics, Sound, and Enhanced Screen displays, it is well suited for a wide range of programming applications. It generates a complete, Ready to Run machine language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Color Basic compilers don't necessarily work this way. Some of their compiler commands need a separate Basic program in order for them to work. In some cases, require that a separate Basic program be interfaced to the compiled program to perform I/O functions, like INPUT, PRINT and so on. CBASIC doesn't do this. ALL of its commands are compiled into a single machine language program that does not require any kind of Basic program to make it work.

COMPATIBILITY

You may be wondering about those statements we made earlier concerning 99% or 99.9% syntax compatibility. What does that other 1% consist of? The biggest part of that 1% has to do with string arrays and vanables. CBASIC does not use a "String Pool" like Color Basic. It uses absolute memory addresses to locate string vanables and arrays. This is why CBASIC's string processing is so fast, it also eliminates the time consuming "Garbage Collection" problem. When CBASIC allocates space for strings, it must know how much space to use for each string. When you Dimension a string variable in CBASIC, you must tell it how much space you want to save for each element. To Dimension an array of 40 strings, 64 characters each, you would DIM DA$(40,64). If a string is not dimensioned, CBASIC will automatically allocate 32 bytes for it. If you want a single string to have enough room for 200 characters you would DIM AX$(200). For string arrays, you would still access the element you want, the same as Color Basic, to get string #30 from the array DA$, you would still use DA$(30), the only real change is in the DIM statement. For undeclared string arrays of 10 elements or less, CBASIC will automatically reserve space for 10 (0-9) strings of 32 characters. In some other Color Basic compilers, you have to declare EVERY string variable used in the progrm in a DIM statement. And, to create an array of 40 strings with 64 characters each, you would have to DIM AD$(2560), and then to access string #30, you would have to multiply 30 × 64 and use a special variable name format or access it one character at a time. Not very compatible or convenient to use, and difficult at best.

CBASIC REQUIREMENTS

CBASIC requires a minimum of 32K RAM and at least one Disk drive. We strongly recommend that you have 64K. CBASIC is compatible with all versions of Color & Extended Basic and both Disk Basic V1.0 and V1.1. Programs compiled on either system will run on systems with different ROMs. CBASIC is NOT compatible with JDOS.

DOCUMENTATION

The Documentation provided with any program is very important to the user. This is especially true when you talk about a program as complete and complex as CBASIC. Even though CBASIC was designed to be the most User Friendly compiler on the market, we went to great lengths to provide a manual that is not only easy to use and understand, but comprehensive and complete enough for even the most sophisticated user. The manual included with CBASIC consists of approximately 120 pages of real information, not like some manuals that put just one or two short paragraphs on a page. If we did it that way, we could have easily created a three or four hundred page manual. The manual index breaks down each section of the manual and gives a 3 or 4 word description of each section and its items along with page numbers. The manual has three sections, the Editor, Compiler and Appendix. Each of these is divided into subsections, with Section and Subsection titles printed at the top of each page. If you want to, you could find the information you are looking for by simply flipping through the pages and scanning the Section titles on the top of the pages. The Manual itself is an 8½ by 11 Spiral Bound book with durable leather textured covers. Some of the reports we have had from CBASIC users describe the manual as being the Best program manual they have ever used.

COMPARE THE DIFFERENCE

CBASIC is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. Compare CBASIC's features to what other compilers offer and you'll see the difference. When comparing CBASIC to other compilers, you might want to keep some of these questions in mind. Does it support I/O functions? You can't write much of a program without PRINT, INPUT and so on. What about complex string statements, or string statements at all? How large of a program can you write? Can you compile a complex string like: MID$(RIGHT$(DA$(VAL(IN$)),LEN(LE$)),3,3)? Can you use two character vanable names for string & numeric variables, like Basic. Does it support all the Hi-Res graphics statements including PLAY, DRAW, GET and PUT, using the same syntax as Basic? Do you ever have to use a separate Basic program? Can you take complete Basic programs and compile them without extensive changes? Will they work? How do you edit a program when it has errors compiling?

PRICE VERSUS PERFORMANCE

The price of CBASIC is $149.00. It is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 2 years writing and refining CBASIC, to make it the Best, most Compatible Color Basic compiler available. Most of our CBASIC users already bought one or more of the other compilers on the market and have since discarded them. We even traded in a few of them. If you want a cheap compiler, we'll sell you one of those traded in, at a good price. Before you buy a compiler, compare the performance of CBASIC against any Color Basic compiler. Dollar for Dollar, CBASIC gives you more than any other Color Basic compiler available.

ORDERING INFORMATION

To order CBASIC by mail, send check or money order in the amount of $149.00 plus $3.00 for shipping and handling to the address to the address listed below.

To order by VISA, MASTERCARD or COD, call us at (702) 452-0632 (Monday thru Saturday, 8am to 5pm PST).

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Doctor ASCII

by Richard E. Esposito

Having technical difficulties? Let the Doctor solve them. Due to the volume of mail Doctor ASCII receives each month, we cannot guarantee that your letter will be published. Please enclose a stamped, self-addressed envelope with all letters for a reply. Send your questions to ***Doctor ASCII, c/o HOT CoCo, 80 Pine St., Peterborough, NH 03458.***

Q. In your July 1985 column, you presented a two-column screen directory program. I tried without success to send the two-column directory to my printer. Can you help?—***M. Talutto, Floral Park, NY***

A. Delete lines 170–200, 220, 230, and 250. Then add the following lines:

```
170  IF N = 1 THEN I = I:GOTO 220
180  FOR I = 1 TO N – 1 STEP 2
190  PRINT# – 2,STRING$(10,'' '');I$(I),I$(I + I)
210  NEXT I
220  IF N = I THEN PRINT# – 2,STRING$(10,'' '');I$(I)
```

Q. In your article, "64K Modification Revisited" (*HOT CoCo*, June 1985, p. 40), you mentioned a piggyback upgrade. Tandy is now selling sets of 200-ns 16K chips for $7.95 and 100-ns chips for $3.95 each. Can I use these?—***Richard Davis, Yogkum, TX***

A. With Microtek Inc. (26541 Baldwin Road, Dearborn Heights, MI 48127) selling 150-ns, 4164-type 64K chips for 69 cents each, why spend more for a 32K upgrade? Also, the piggyback upgrade is not compatible with software that puts a high-resolution screen above the 16K boundary. It made sense when 64K chips were selling for $50 each, but today I wouldn't do a piggyback upgrade even if I got the chips for free.

Q. My Radio Shack catalog says that I can have up to four drives with my CoCo. Where do you hook them up? Do I need a new cable, or is the reference to double-sided drives?—***Timmy Lindner, Patterson, CA***

A. You need a new cable in any case. If you stick with Tandy drives, you need their four-drive cable with its missing teeth. If you go with double-sided drives, you can have a maximum of three using a non-Tandy cable without missing teeth. Tandy extracts three of the four teeth that connect to the disk controller's drive-select lines, allowing you to move Tandy drives to different connectors on the cable and still have the one closest to the controller as drive 0. Other manufacturers use jumpers inside the drives to determine a drive's number, so you don't have to remove teeth from the cable. Double-sided drives use the drive 3 select as a side select, making it impossible for Tandy's cable with its three missing teeth to select both drive and a side.

Q. I have an older TEAC full-width drive I purchased from Displayed Video with their controller and RS DOS 1.1. I want to add a Tandy drive 1 to my system, but I received no technical manual with the unit. Does it have a terminating resistor? Do I need a new cable? Should I remove the TEAC's terminating-resistor pack?—***Michel Grimard, Sherbrooke, Quebec***

A. Since your TEAC has a terminating resistor and the Tandy drive 1 does not (Tandy puts a terminating resistor on drive 0—move the resistor to the highest-numbered position when you add drives), use the Tandy as drive 0 and the TEAC as drive 1. Remove teeth 12, 14, and 32 from the drive connector closest to the controller connector on your cable. The teeth are numbered from bottom to top, with the open slot facing you, as shown below:

```
33  34
31  (32)  ←remove
29  30
27  28
25  26
23  24
21  22
19  20
17  18
15  16
13  (14)  ←remove
11  (12)  ←remove
 9  10
 7   8
 5   6
 3   4
 1   2
```

You also need to move a jumper inside your TEAC to make it drive 1.

Q. Why is it recommended that you use the instruction A = RND(– TIMER) to seed the CoCo's random-number generator? I assumed that TIMER would give a different value each time I ran the program, but typing PRINT(– TIMER) always returns a zero.—***Jules LaFrance, Ottawa, Ontario***

A. TIMER gives the time since you turned on your CoCo, but only if you have Extended Color Basic. Otherwise, the CoCo treats it as an ordinary variable, which has a value of zero by default. I'll explain how RND works, since the CoCo's manual does not do a good job of it:

- If the argument of RND is positive, RND gives you a random integer between one and that number.
- If the argument of RND is zero, RND gives a random decimal between zero and .999999999.

● If the argument of RND is negative, the argument is used to reseed the random-number generator, hence the use of – TIMER.

Q. I want to learn Assembly-language programming. Can you recommend some good books and an inexpensive assembler? How do you hand-assemble an Assembly-Language program?—***Shawn Long, Hurdle Mille, NC***

A. I reviewed five Assembly-language programming books for the CoCo in the March 1984 *HOT CoCo*, p. 38. The two most popular assemblers for the CoCo are Tandy's EDTASM + ($39.95 ROM pack, catalog no. 26-3250; $59.95 disk, catalog no. 26-3254) and The Micro Works' (P.O. Box 1110, Del Mar, CA 92014, 619-942-2400) SDS80C ($89.95 ROM pack) or Macro-80C($99.95 disk). Bill Barden's *TRS-80 Color Computer Assembly-Language Programming* (available from Tandy) supports the former, and Don and Kurt Inman's *Assembly-Language Graphics for the TRS-80 Color Computer* (published by Reston) supports the latter. You can order technical information on the CoCo's MC6809 microprocessor from Motorola Semiconductors, 3501 Ed Bluestein Blvd., Austin, TX 78721. Ask for Advance Information #ADI-847. It contains data on the 6809E's instruction set and other technical information. I believe it is still free for the asking.

You can use Basic POKE statements or a monitor program such as the one that appeared in Doctor ASCII, December 1983, p. 129, to hand-assemble machine-language programs. The problem with hand-assembly is that it is the time-consuming job of translating the op-codes and data into numerical inputs that you can enter into memory.

Q. Where can I get information on the CoCo's new video-display generator?—***Allen Elmer, Fallbrook, CA***

A. Write Motorola Semiconductors at the above address. Ask for advance information on the MC6847-T1.

Q. How can I tell which PC board I have in my old grey CoCo?—***USN CDR Robert B. Pinell, San Diego, CA***

A. After removing the CoCo's cover, with the keyboard facing you, look for a serial number below the ROM-pack port. It will end with either a D, E, NC, or 285. If it is one of the first two, that letter is the board type. If it is one of the latter two, your board is what CoCo-nuts have christened the F board.

Q. I recently purchased a 64K CoCo 2, but I get only 24,871 free bytes when I turn it on. Do I really need disk drives and OS-9 to get 64K?—***William C. Privett, Roseville, GA***

A. Your CoCo has 64K of RAM plus 16K of ROM for a total of 80K of memory. The CoCo can address a maximum of 64K at a time. When you turn on your CoCo, you have 32K of RAM, of which Basic uses 8K (6K for high-resolution screens and 2K for housekeeping). With Extended Basic, your interpreter is in ROM and is addressed from locations 32768 to 49151. Adding ROM packs or Disk Basic gives you up to 32K of ROM. This RAM/ROM mode is called memory map 0. You can access the other 32K of RAM in one of two ways: You could swap out the ROM for the other 32K of RAM for memory map 1. This is what OS-9 does, but so do a lot of other software packages such as Telewriter-64, which comes in a cassette version. Another way is to have two lower banks of 32K. This is the way print spoolers are usually implemented on the CoCo. With two lower banks, you get maximum memory use of your CoCo. Some programs using this method have 55K buffers.

Q. I want to put machine-language programs into high memory at location 44560. In "Printer Answers" (*HOT CoCo*, March 1985, p. 24), you said, "Those of you with 64K can enable memory map 1 and offset load into high memory," but you didn't say how.—***Albert M. Huntley, Windsor, VT***

A. You need the program 64K Enable (*HOT CoCo*, June 1985, p. 45).

Q. The Tandy manuals show how to use the cassette to form files for storing data, but they create files that are only 12 lines long. What do I do if I have more than 12 lines of data, and how can I scroll through it?—***M.S. Casey, Sr., Casper, WY***

A. You need an editor program. Better than an editor program is a word processor that generates ASCII files. There are many good ones for the CoCo, including Telewriter-64, VIP Writer, and Elite-Word.

Q. I have Tandy's Micropainter ROM pack. On my new CoCo, it produces green in color set 3 instead of blue. I finally swapped display chip AN48331 for chip number AN48324. I now have blue skies.—***Dennis Sledge, Ty Ty, GA***

A. Thanks. Perhaps this will help someone else.

Q. Can you recommend a book on high-resolution moving animation?—***William L. Warren, FPO, New York, NY***

A. Try Don and Kurt Inman's *Assembly-Language Graphics for the TRS-80 Color Computer*, published by Reston. You might also be interested in the series of articles from *HOT CoCo* called "Anatomy of an Assembly-Language Game" (June through November 1984), by Mike Meehan. ■

Mindbusters

by Richard Ramella

The Wild Blue Yonder

If you were handed a sheet of paper containing your name and 999 others, you would probably be able to spot your own name so quickly you'd think it happened by chance. But it doesn't.

The human brain has the ability to quickly focus on those things that are most important. And your name is one of the most important things you possess.

In a world of sensory overkill, this brain capability is especially useful. Executives scan mounds of memos, almost subconsciously discarding the chaff. Parents sleep soundly in an apartment next to a noisy interstate route but awaken if their baby whimpers in the next room. A loved one's features can be picked out of a crowd of hundreds a hundred yards distant. We tend to skim newspapers and flip the dials of radios and TVs, stopping only where our emotions and intellect direct.

I tested this idea by offering a child a bowl filled with a mix of peanuts and light chocolate candies of about the same size, color, and shape as the peanuts. As I watched, her eyes narrowed and flitted over the surface of the bowl's contents. Then they widened and she reached out and plucked up the chocolates without disturbing a single peanut.

We have learned not only to focus but also to ignore, a two-edged ability that helps us solve problems. Answers are derived from patterns that are part of the puzzle—patterns that are extracted from chaos.

Up and Away

Before I tell you about this month's puzzle and contest, it is time to announce the winner of Puzzle Contest II—Consarnation. The winner is Rich Harder of Northlake, IL. His answer string, one of several that yield the highest possible score of 82 points, is:

EEEESSSSSSNNEEEESSEENNWWSS
WWNNEENNWWNNWWEESSSSWWWW.

He will receive a free, one-year subscription to *HOT CoCo*. Congratulations, Rich.

The puzzle-busting abilities of Mindbusters readers are enough to keep a poor puzzle creator up nights trying to build a better mousetrap. Some 38 entrants had the correct answer to Consarnation. But I can guarantee that there won't be so many right answers to future Mindbusters puzzle contests. And you're right if you read that as a challenge.

The Program Listing this month is called Wild Blue Yonder. It is a Basic listing that will run on all Color Computers. For the MC-10, change the P = 1024 in line 120 to read P = 16384. The introductory comments above might help you solve Wild Blue Yonder. But if you are not able to solve the puzzle, the answer will be printed in a future issue. And for those of you with bright ideas, good luck trying to solve it with a simple automatic-play algorithm—theoretically, the first 10 moves have more than a billion combinations.

When you run Wild Blue Yonder, you will see part of a large oblong group of single-digit numbers between one and nine on a field of blue. As the puzzle is first drawn, only the upper half of the number field is visible. You move up and down the oblong by tapping the up- and down-arrow keys. As the puzzle begins, the flashing orange cursor is on a number 3 at the center of the oblong.

You can move the cursor in any of eight compass directions by tapping the following two-character commands: NN for north, SS for south, EE for west, WW for west, NE northeast, SE for southeast, NW for northwest, and SW for southwest. The number on the space that the cursor is resting determines how many spaces the cursor will move in the direction you choose. The first direction you select in Wild Blue Yonder will always move the cursor three spaces.

The object of the puzzle is to find your way yonder—to the blue area of the screen surrounding the oblong. However, don't go too far. A winning position is any blue space touching the perimeter of the oblong field of numbers. If you direct the cursor more than one space outside the oblong, you'll have placed it in limbo. You cannot move from a position that is not within the field of numbers, and your only recourse is to restart the puzzle. There is one other important rule: The line of travel to reach a winning position cannot fall over any of the blue area.

The program purposely allows the possibility of game-ending Basic error messages. Keep in mind that the number position to which you will move the cursor in making a direction selection must be visible on the screen. A move that takes the cursor "off the screen" will produce an FC (illegal-function call) error.

When you make 61 moves without finding your way out, the program ends with an OS (out of string) error. This is also purposeful, for the solution takes fewer than 61 moves. Once you have solved Wild Blue Yonder or completed an attempt, you can display a list of the moves you made by typing "PRINT SC$" and pressing the enter key. One last note: Be sure to turn up the sound on your TV or monitor; random tones will sound if you beat the puzzle. Ladies and gentlemen. . .fry your brains!

Puzzle Contest VII

This month's puzzle contest involves the solution to Wild Blue Yonder. When and if you solve it, type "PRINT SC$" to see the move string. Using some or all letters in the string, spell the longest English word you can. The winning move string and the word you form will constitute your entry. The winner will receive a one-year subscription or extension to *HOT CoCo*. Next month: Uncle Arnold's coin game.■

Eds. note—To enter Puzzle Contest VII, send your name, address, move string, and the word you spelled to Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926. The winner will be the entrant who offers the correct move string and the longest English word spelled with its letters. In case of a tie, the winner will be selected at random from the tying entrants. Entries must be postmarked by November 30, 1985.

Program Listing. Wild Blue Yonder

```
100 REM * WILD BLUE YONDER * COL
OR BASIC
110 CLS3: PRINT @ 232, "WILD BLU
E YONDER";
120 CLEAR 800: P=1024: DIM A$(24
),J(3): FOR A=1 TO 21: B$=B$+CHR
$(175)
130 IF A=1 THEN B1$=B$
140 IF A=2 THEN B2$=B$
150 IF A=3 THEN B3$=B$
160 IF A=4 THEN B4$=B$
170 IF A=5 THEN B5$=B$
180 IF A=6 THEN B6$=B$
190 IF A=9 THEN B9$=B$
200 NEXT: CLS3: U$=CHR$(94): D$=
CHR$(10)
210 A$(0)=B$: A$(1)=B$: A$(2)=B9
$+"477"+B9$
220 A$(3)=B6$+"544833463"+B6$
230 A$(4)=B4$+"1451114517135"+B4
$
240 A$(0)=B$: A$(1)=B$: A$(5)=B3
$+"494967555876685"+B3$
250 A$(6)=B2$+"37298356739187585
"+B2$
260 A$(7)=B2$+"14784292711822763
"+B2$
270 A$(8)=B1$+"721855311313342861
3"+B1$
280 A$(9)=B1$+"426725242254328177
3"+B1$
290 A$(10)=B1$+"41651119143443198
27"+B1$
300 A$(11)="435232232425351135537
"
310 A$(12)="271511315332423775427
"
320 A$(13)="252261244634121265188
"
330 A$(14)=B1$+"4375193445294195
748"+B1$
340 A$(15)=B1$+"4167834341312323
624"+B1$
350 A$(16)=B1$+"7326153923215758
954"+B1$
360 A$(17)=B2$+"1673481212122894
1"+B2$
370 A$(18)=B2$+"2547875613578729
3"+B2$
380 A$(19)=B3$+"656467252263474"
+B3$
390 A$(20)=B4$+"2312333213211"+B
4$
400 A$(21)=B6$+"744573447"+B6$
410 A$(22)=B9$+"334"+B9$: A$(23)
=B$: A$(24)=B$
420 H=398: Y=0: GOSUB 660
430 X$=INKEY$
440 H1=PEEK(P+H): POKE P+H,255:
GOSUB 670: POKE P+H,H1: GOSUB 67
0
450 IF PF>349 AND PF<357 THEN PO
KE P+H,255: SOUND 100+RND(50),1:
 GOTO 450
460 IF X$="" THEN 430
470 IF X$=D$ AND Y>0 THEN Y=Y-1:
 H=H+32
480 IF X$=U$ AND Y<9 THEN Y=Y+1:
 H=H-32
490 IF X$=D$ OR X$=U$ THEN GOSUB
 660
500 IF X$="N" OR X$="S" OR X$="W
" OR X$="E" THEN C$=C$+X$
510 PK=VAL(CHR$(H1-64)): PRINT @
 93,C$;: IF LEN(C$)<2 THEN 430
520 IF C$<>"NN" AND C$<>"SS" AND
 C$<>"WW" AND C$<>"EE" AND C$<>"
NW" AND C$<>"SE" AND C$<>"SW" AN
D C$<>"NE" THEN 680
530 IF C$="NN" THEN H=H-(PK*32)
540 IF C$="SS" THEN H=H+(PK*32)
550 IF C$="WW" THEN H=H-PK
560 IF C$="EE" THEN H=H+PK
570 IF C$="NE" THEN H=H+PK-(PK*3
2)
580 IF C$="NW" THEN H=H-PK-(PK*3
2)
590 IF C$="SW" THEN H=H-PK+(PK*3
2)
600 IF C$="SE" THEN H=H+PK+(PK*3
2)
610 IF PEEK(P+H)<>175 THEN 680
620 SC$=SC$+C$
630 J(0)=PEEK(P+H-32): J(1)=PEEK
(P+H+32): J(2)=PEEK(P+H-1): J(3)
=PEEK(P+H+1)
640 PF=0: FOR T=0 TO 3: IF J(T)>
112 AND J(T)<122 THEN J(T)=J(T)-
113
650 PF=PF+J(T): NEXT: GOSUB 680:
 GOTO 430
660 G=Y: FOR X=4 TO 484 STEP 32:
 PRINT @ X,A$(G);: G=G+1: NEXT:
RETURN
670 FOR T=1 TO 20: NEXT: RETURN
680 C$="": PRINT @ 93,B3$;: GOTO
 430
690 REM * END OF LISTING
```


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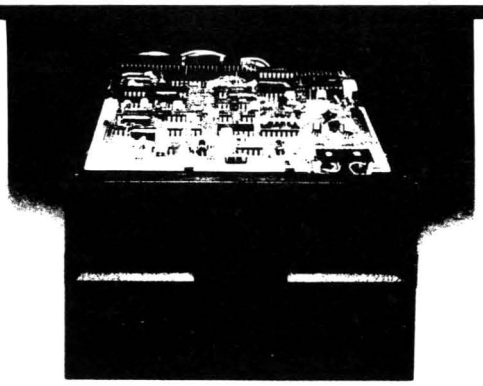

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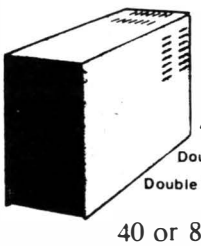

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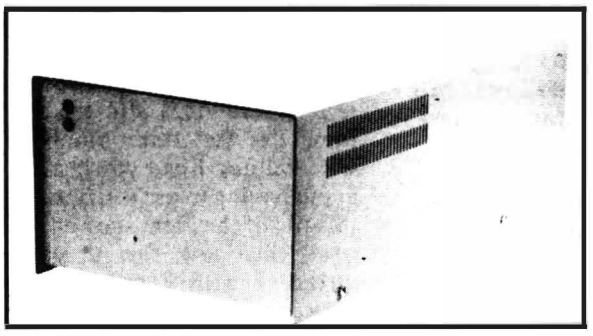

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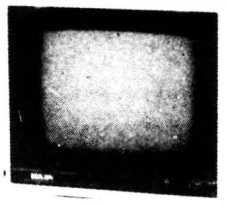

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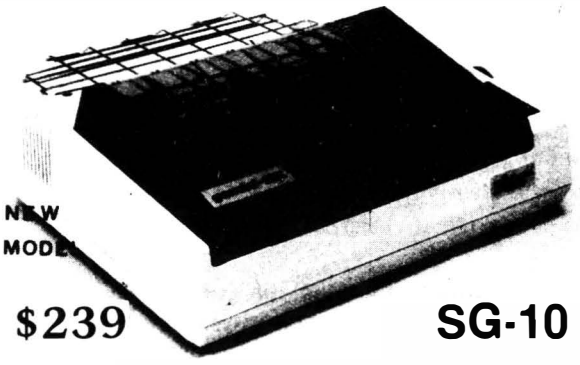

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The Computer Room

by Scott L. Norman

Catching Up with Appropriate Technology

During the energy crisis of the 'seventies, we heard a lot about using "appropriate technology," which meant that you should use no more than the minimum amount of sensible technological leverage to perform a given task, so as to consume the fewest resources and do the least damage to the environment.

Perhaps we should extend the same thinking into the area of personal software. Have you ever shown off your CoCo, only to be asked, "But what do you *use* it for?" That's often a tough one to answer. It's easy enough to computerize a store or office, but much more difficult to pin down the proper role for applications software in the home.

Record keeping and fact finding seem like natural applications: There are always a million things to keep track of around the house. For this, I find smaller, specialized software packages to be of more use to the less technically minded members of the household than are powerful, general-purpose programs that require more computing expertise. More important than software that offers raw computing power are such factors as acceptance of user input in a variety of formats, the ability to retrieve information based on partial or imperfect matches to a request, and extensive error trapping: user friendliness, in other words.

For Dedicated Shoppers Only

If you do much grocery shopping, especially for a large family, a data-file manager that keeps track of your grocery coupons could be a significant aid to your budget.

Kolourdex for Koupons is a product of the Kensoft company (2102 50th St., Kenosha, WI 53140). The program requires 32K and comes on tape for $24.95 or disk for $28.95. (You can also buy a tape-to-disk upgrade for $7.50.) It can tell you if you have a coupon for a specific product, list all your coupons that apply to a particular type of item, and display all the coupons that expire on or before a specified date or that are worth more than a specified amount. The tape version can keep track of 400 coupons, while the disk edition can handle 720.

Programs like Kolourdex have a place in certain homes, and I'm going to use it to illustrate some good and bad practices found in home software. This isn't meant to be an exercise in picking on the product; it's by no means the worst offender I've ever come across. Kolourdex does, however, contain features that exemplify some of my thoughts about using the appropriate technology to computerize everyday activities.

The nonprotected Kolourdex disk contains three Basic files: KDXKPNSD, the main program; KDXKPNDL, which reorganizes data; and KDXKPININ, which initializes a new file when you first run the system. The single data file on a given disk is always assigned the default name KPNS. This file, and some necessary indices, are created as you work with the program.

But why such confusing file names? I prefer something easier to remember. A quick fix to this problem is to add a couple of one-line "shells" to your program disk to call the real program. For example, you might store the one liner, 10 RUN "KPXKPNSD", under the name COUPONS/BAS, so that your Kolourdex command line would be the easily recalled RUN "COUPONS". I use such calling routines with a lot of my favorite applications software and frequently include a POKE statement in the startup routines to establish 9,600-baud communication with my printer, as well.

You could simply rename the main program and be done with it, but I prefer to use a separate routine whenever I think portions of a commercial program might call each other by their original names. I wouldn't want to rename the main Kolourdex file and then find that part of the code contained an explicit reference to the original name, KDXKPNSD.

Once underway, Kolourdex lets you add coupons to a file, examine records selected according to several criteria, and change or delete records; in other words, it's a well-behaved little data manager. A coupon record consists of just a few items: the description (the specific name of the product), the coupon value, the expiration date, and the product type. The latter is a number from 1 to 12 and is used for selecting subsets of a data file. Normally, you use the codes that Kolourdex assigns: number 1 for baby food, cereal, and other breakfast foods; 2 for dairy products, margarine, diet products, and oils; and so on. You can assign your own meanings to these codes as long as you use them consistently within a given file, but I can't find a reason to make such changes. The originals seem to cover everything on a typical shopping list.

You enter data for each coupon in response to video prompts. Kolourdex accepts coupon value data in several formats. For example, if you have a 25-cent coupon, you can answer the amount prompt with $0.25, 0.25, or .25. That's the way a consumer-oriented program should behave. On the other hand, coupon descriptions cannot exceed 19 characters. That's not enough, especially when you include the manufacturer, which is necessary information.

If you've got the patience, you could go into Kolourdex and change the 19-character limit by altering all references to the length of the description field and the total space set aside for each record. However, lengthening the individual records means reducing the capacity of your file.

Kolourdex can deal with multiple identical entries—a good feature that lets you keep track of several copies of the same coupon. However, the program's ability to search for a particular entry is somewhat limited. Any target string you enter must match the first part of the coupon description. If you have an entry entitled ABC Corn Flakes, you'll never find the coupon listing unless you specify a string beginning with ABC as your search target. (Actually, just specifying A is acceptable, but you'll generate a lot of false "hits.")

This method works fine if you adhere to a fixed format when you enter your coupon data. I prefer a more forgiving type of search for a consumer product—one that reports a hit whenever the target matched any substring of the description. For example, at one time I might be interested in a coupon specifically for ABC Corn Flakes, while at another I might want a coupon for any old corn flakes.

Kolourdex should also include a print routine, just in case you don't have your coupon files right in front of you as you run the program, or so you can pick items of interest as you type your shopping list. Kolourdex author Glenn Janes suggests that the Delete Koupons (sic) routine might be a good place to insert a couple of PRINT# – 2 statements to provide printout capability.

Kolourdex is inexpensive and includes enough file-handling code to form the basis of a useful piece of home software. It does need a couple of modifications, though. Let me know if patches of the sort I've outlined are of interest to you; perhaps we can return to the program and do some polishing up. I'd also like to have your thoughts about the practicality of household software, user friendliness, and related matters. ■

Scott Norman is the manager of solid-state science at GTE Laboratories in Waltham, MA. Write to him at 8 Doris Road, Framingham, MA 01701.

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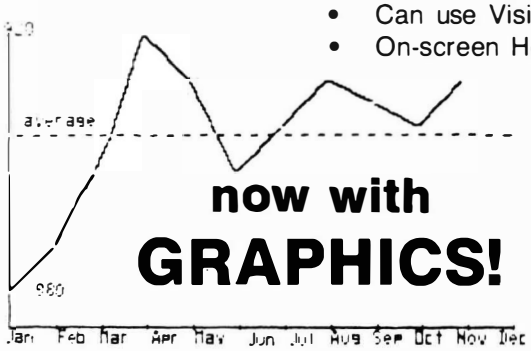

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Reviews

edited by J. Scot Finnie

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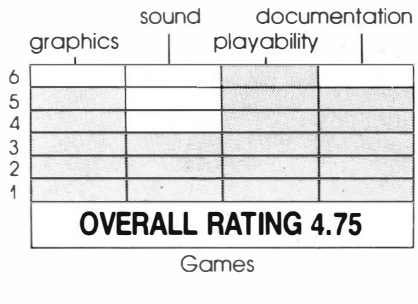
Review-Ratings Key

6	Unsurpassed
5	Excellent
4	Above Average
3	Acceptable
2	Needs Improvement
1	Unsatisfactory

Ed. note—The overall ratings that appear in the review-rating graphs are an average of the ratings for all the categories rounded to the nearest quarter of a rating point.

The P51: No Milk Run

by Scott L. Norman



P51 Mustang Attack Flight Simulator is marketed by Tom Mix Software, 4285 Bradford N.E., Grand Rapids, MI 49506, 616-957-0444. It requires 32K and sells for $29.95 on cassette and $34.95 on disk. A three-foot cable to connect two Color Computers for dog fighting is available for $10.95.

Tom Mix Software has sent us on perilous high-tech reconnaissance missions with SR-71 and challenged our weekend airmanship with Worlds of Flight. (See the reviews in the April and December 1984 issues of *HOT CoCo*, pp. 32 and 20, respectively.) P51 Mustang Attack offers armchair aces the chance to recreate a bit of the tough World War II fighter combat. So slip into your old leather jacket, strap in, and follow me.

The Cockpit and Flight Plan

P51 makes use of some of the out-the-window display technology introduced by Worlds of Flight. The scenery is much less detailed, however. All you see through your P51's windshield are the horizon, a few airfields, and enemy aircraft. The engine sounds are gone, too. I presume that these simplifications were made in order to speed up the action. P51 comes close to giving real-time response. That's critical to the program's major innovation—the ability to link two CoCo's in mock combat!

Although there is a solo mode in which you can sharpen your flying and gunnery skills, the real action begins when you connect two computers, fire up a copy of P51 in each, and do battle. The computers can either be right next to one another linked with a short null-modem cable or at opposite ends of the country connected by modems and telephone lines. The latter method slows down screen responses by a factor of two or so and opens up the possibility of horrendous telephone bills, but it does work.

The cockpit display consists of the windshield with gunsight and a small but busy instrument panel containing airspeed indicator, altimeter, various status readouts, and navigation aids.

P51's action takes place in the skies above four 10-mile quadrants arranged in a square grid like this:

1 2
3 4

Its square world wraps around, so if you fly past the border of one quadrant, you merely enter the next one along the aircraft's projected track.

Each quadrant contains a single runway, and in the war-game mode, you can capture an enemy airfield by scoring gunnery hits on its landing beacons, denying use of the runway to your opponent.

You can call for a birds-eye view of any world on radar or switch over to a conventional compass. The radar can even be reset to eliminate the clutter of old flight tracks. This is handy after combat when you are trying to get your bearings to return to a friendly airfield.

Flight Control

As befits software named for the best fighter-bomber of its time, the simulated P51 is a hot aircraft. Fully controlled rolls and inside and outside loops are possible. And the performance figures seem realistic: at full throttle, an inside loop takes about 15 seconds and a 360-degree roll about half that. The manual contains a concise discussion of the principles of flight, including those aspects that have been simplified for the purpose of this program.

The throttle, landing gear, and flaps are controlled from the keyboard, while the ailerons, elevators, and guns are operated by the joystick connected to the right joystick port. (The simulated P51 does not have a rudder control.) I recommend, as does the manual, that you use joysticks with P51 Mustang Attack that provide spring centering and adjustable trimmers, such as Tandy's Deluxe Joystick made by Kraft.

A final control feature is the wing leveller, a kind of fictitious autopilot that keeps the wings horizontal and the aircraft heading constant unless you continuously force the aircraft into a banked turn. The wing leveller is a boon to the novice, but it slows down the P51's roll rate and should be switched off for combat.

The Dog Fight

In the solo practice mode, the CoCo generates an image of a drone aircraft at which you can shoot. The drone always flies a straight course, descending continuously from

51,000 feet down to the ground. That doesn't make it a sitting duck. First you have to find it, using your radar and your Mark I eyeballs; then you have to maneuver your plane into a good firing position and shoot accurately. You have 99 shots in each of your two wing guns, and you can squeeze them off one at a time or fire continuously.

Although 99 rounds per gun is a little skimpy, the actual firing time available to you seems realistic. Your fighter's limited fuel supply is also a factor. If you keep the throttle wide open, you'll only have enough fuel for 10 minutes of flight! You can refuel and rearm by landing at a friendly airfield.

I found P51 surprisingly easy to land, although multiple bounces (complete with sound effects) are not uncommon. The rapidity with which the screen updates helps the learning process. However, the landing skills I acquired in Worlds of Flight might have something to do with how easy the landing process seems to me. And landing is by no means guaranteed. Attempts at high-speed landings will result in damaged landing gear or worse.

Players in a two-person game can signal each other as to the status of the hostilities, the categories of which are peace, war, talk (a game-freeze mode), and "turkey." The last category is equivalent to declaring war, but it allows you to insult your opponent first!

Once engaged in a dog fight, the displays of the two computers are updated simultaneously. Enemy hits cause bullets holes to appear on your windshield and control panel. The manual has a chart that shows the damage inflicted on your plane based on the location of bullet holes. These damages, plus the distance, if any, by which you miss the runway in landing, govern the time it takes to repair your aircraft after you land. In the meantime, your opponent could be shooting up your runway beacons.

The actual conduct of P51 Mustang Attack warfare is complicated; the details of aircraft replacement, repair times, and so on are in the documentation. It is possible to specify one of three skill levels for each player; the higher the skill level, the greater the number of hits is required to inflict each kind of damage to your opponent's plane.

Debriefing

I am enthusiastic about this latest Tom Mix flight simulation. What would I change if I could? The altimeter (the two-hand type) should be modified to include a multiples-of-10,000-feet indicator. It is easy to lose track of your altitude in a dogfight when your sole concern is concentrating on getting your opponent into the sights. By the time the P51's altitude-warning horn goes off at 500 feet, it might be too late to take corrective action. This is no particular fault of the simulation, however. A human-factors specialist once told me that World War II altimeter designs often invited misinterpretation by pilots during stressful moments.

Outside of that, I found only one potential glitch in the program. As an experiment, I deliberately took off with the wing flaps lowered. By the time I got the flaps cleaned up, I found that I couldn't retract the landing gear. Although this is an unlikely situation, it's a tough way to fight a war.

P51 Mustang Attack is a fine program and an outstanding simulation that leaves very little room for criticism. But I do have one historical bone to pick: The airplane pictured in the promotional material for P51 Mustang Attack is actually the P40 War Hawk. Sloppy, guys, very sloppy. ■

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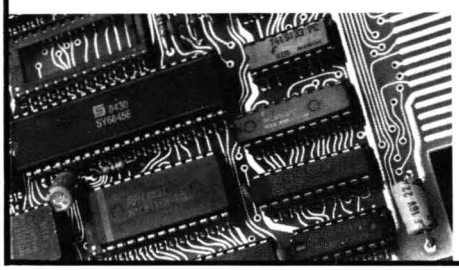
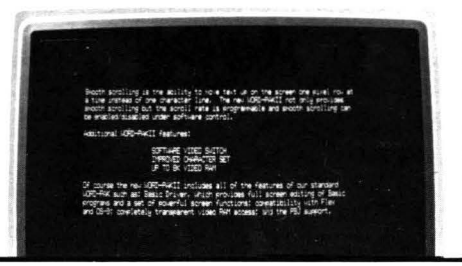
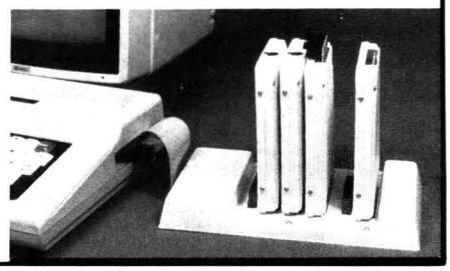
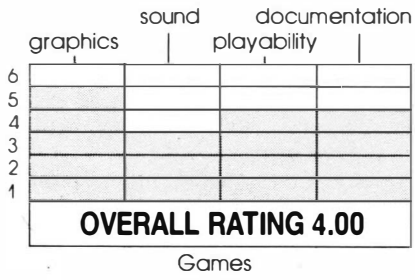






Marooned

by Richard Ramella



Marooned is a graphics-adventure game marketed by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, 303-728-4937. It requires 32K, Extended Color Basic, and a disk drive. It sells for $29.95

In every mystery there is a door that must be opened, no matter the danger.

When the UFO lands in the cornfield, you won't just wave at it and go to bed. You are adventurous, so you'll walk up to the strange craft and step inside. And then it will take off, of course.

Lucky for you, Marooned is a graphics adventure. For the hardcore adventurer it will be fairly easy. Beginners with a logical approach will find it tantalizing and eventually accessible.

If you have never tried a computer adventure, a brief explanation is in order. Text and graphics adventures are stories in which you are the main character. You travel in logical moves on an electronic map. You can pick up articles you find along the way, use them, and even confront characters within the story plot. The central problem usually focuses on a mixed struggle for survival and escape. And Marooned is no exception.

At the start of the game, after the space ship takes off, you wander among the rooms of the alien aircraft, finding and using articles. It isn't telling too much to reveal that you will probably succeed in crashing the ship onto an alien planet—where the game continues. The landscapes of the planet are more artful than the sterile rooms of the ship, but I was confused at times when the same landscape showed up in several places.

Marooned bows to convention with a simple lexicon of two-word commands with which veteran computer-adventure players will be familiar. The simple construction requires one verb and one object, such as *get gold, drop worm,* and *examine chair*. You can even ask for hints, although not many helpful ones are provided.

As in most computer adventures, it is possible for your game character to die. But Marooned offers a game-save feature that allows you to store as many as nine different game positions on disk. A player can stop and save the game at a critical point and go back to it later. The best way to use the game-save feature is to chain your game saves. When you reach a critical point in the game, save it. Then when you make it past the danger unscathed, save the game again to the same file name. If you don't make it past the next critical point, you'll be able to start out past the last one. As you are nearing completion of the adventure, you'll find that you have a chain of game saves charting the most important moments of the adventure.

Marooned's title screen shows the alien spacecraft in flight.

Marooned is essentially a Basic listing overlaid on scenes drawn from binary files. This makes the game fairly fast. The program also features text in the Extended Color Basic graphics mode. I found a minor bug while adventuring in a cave location, where I insisted on going in an illogical direction. It caused a BS (bad subscript) error and loss of the game. This single flaw is no reason to rule out this interesting game, however. Saguaro Software guarantees the program disk to load for the original owner for life and offers to replace the disk if it fails. You can also make a copy of the disk for safekeeping. The program's documentation is simple and to the point. It consists of only two pages, but it is enough to get you started. You'll take it from there.

Marooned's theme—wandering aboard a deserted UFO and being stranded on an alien planet—is not a strictly new idea to computer adventure. But if you have never been on an alien planet, Marooned will be new to you. The game is both fun and challenging. Its graphics are good, and its mysteries are not so overpowering as to verge on boring most players. I recommend Marooned, especially to first-time adventurers. ■

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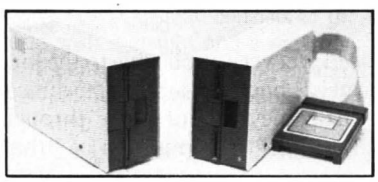

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THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...
— Color Computer News, Jan. 1982

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But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

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Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

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— The RAINBOW, Jan. 1982

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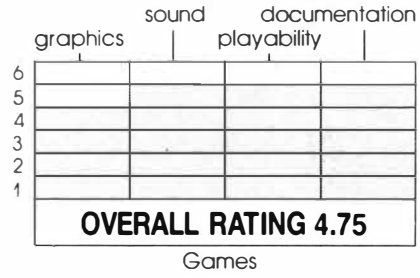
Hot for Trivia Fever

by Mark E. Reynolds
HOT CoCo staff



Trivia Fever is manufactured by Professional Software Inc. for Tandy Corp. (catalog no. 26-3295), 1400 One Tandy Center, Fort Worth, TX 76102. The game requires 64K and a disk drive. It sells for $29.95

What do tree trunks and fish scales have in common? Who played the piano-playing Sam in *Casablanca*? Where did Davy Crockett make his last stand?

These are some of the 32,000 questions that come with Professional Software's Trivia Fever, an entertaining outlet for anyone caught up in the wave of trivia gaming that has swept the country recently.

From the top down, Trivia Fever is a nice product. Everything about it shows that its designers paid attention to quality: The sturdy and attractive box contains the game disk, startup instructions on heavy paper (including troubleshooting tips), a handsome book of questions and answers, a pad of tally sheets, a game spinner, and three color-coded bookmarks.

One of the best aspects of the game is that you can play it with or without a computer. To play the computer version, all you need is the game disk and your CoCo. The book, tally sheet, spinner, and bookmarks let you play without electricity. And yes, both versions require a sharp memory.

Program quality is also excellent. The first thing you'll notice is that Trivia Fever doesn't load like most programs you're used to because it is written in OS-9 compiled Basic and requires an OS-9 loading routine. Professional Software ported the game to the Color Computer under license from Tandy, which wanted OS-9 included for upward compatibility with future versions of the Color Computer.

If you have Disk Extended Color Basic version 1.0 and don't have OS-9, you must type in an 18-line program (provided with the startup guidelines) to create a Trivia Fever boot disk to load the game. If you have Disk Extended Color Basic 1.1 or later, you simply type DOS and press the enter key.

Playing instructions are on the disk. After you read them, you type in the game master's (or moderator's) name and the names of the players or teams. Trivia Fever can be played by one to eight players. There are three ways to handicap individual players or teams, making it possible for players of varying abilities to compete with each other. Better players can select shorter time limits in which to answer questions, choose a higher level from the three levels of difficulty, and pick those categories (from the seven the game offers) that they find more difficult.

"Everything about Trivia Fever shows that its designers paid attention to quality."

Once you have set up Trivia Fever the way you want it, you remove the disk from your disk drive, flip it over, and reinsert it to load the questions. Game instructions and questions appear on screen in attractive upper- and lowercase letters. The game master, who may also be one of the players, controls the keyboard and answers prompts for information. Upon receiving an answer from a player, the game master presses keys to stop the clock, display the correct answer, and tell the computer whether or not the correct answer was given. Play moves along quickly and smoothly.

The program keeps score, gently chiding players for wrong answers and rewarding those who answer correctly with encouraging words. Successful players might also elicit a few bars of such tunes as "I'm Looking Over a Four-Leaf Clover," the "William Tell Overture," and "Whistle While You Work."

Error trapping is excellent. Trivia Fever will only accept keyboard input that reasonably answers program prompts. That means that even younger members of the family can safely have a turn at being game master. Trivia Fever is very easy to use and play. The few paragraphs of documentation that come with the package are all you need to get going. And if you exhaust the 32,000-question data file, you can order Volume II, an additional set of questions, from Professional Software Inc., Box 533, Needham, MA 02194. Or phone their toll-free number, 1-800-343-4074. Sports buffs can order Super Sports, a separate game that offers thousands of sports-related questions in seven categories.

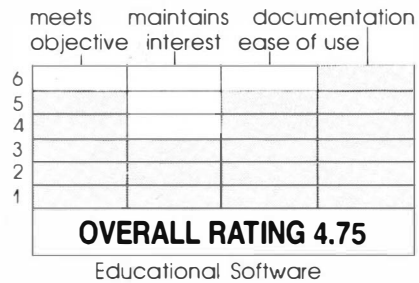
And don't forget that you can also play Trivia Fever without a computer. It is one CoCo game that can amuse everyone on long car trips. Even the person behind the wheel can play as long as someone else is asking the questions.

If you enjoy the mental exercise and friendly interaction that are a part of trivia gaming, you'll appreciate Trivia Fever. Even if you are not much for trivia, you'll have to admire the high quality of this product's programming and packaging, which makes it compare favorably with many other Color Computer programs.

So, are you ready to play Trivia Fever? I'm still trying to remember who played Sam in *Casablanca*. ■

A Spelling Adventure

by Richard Ramella



Spelling is a series of 16 programs, contained on eight program cassettes, that covers the rules of spelling for grades 4 through 6. The series is available from Dorsett Educational Systems, P.O. Box 1226, Norman, OK 73070, 800-654-3871, 405-288-2301 in OK. The package requires 16K and sells for $59.95.

Before completing my evaluation of this package, I told my son: "I'd like you to help me test some educational software called Spelling."

"No, thank you," the 9-year-old replied evenly. "I'd planned to go swimming in a volcano."

"Aw, come on!"

"Don't you get it, Dad? No! N-O!"

Later, when the boy was tightly bound to a chair in front of the computer, I loaded Talk/Tutor, a monitor program that activates each of the 16 lessons in this eight-tape collection. "Let's try some homonyms" I said as I slipped in the lesson cassette.

He threw his forearms over his eyes like Dracula reacting to sunlight and screamed, "Child abuse! Mom! Help!"

"Glad to see you're getting in the spirit of things," I told him between gritted teeth.

Particulars

We were already familiar with Dorsett's style of learning programs. A taped narration matches the screen text, and there are small, well-drawn illustrations. As the narrator noted the similarity and differences between the words *way* and *weigh*, my sullen young learner began to perk up. "Puns," he said. "It's talking about puns!" And just like that, the lesson was a success. Homonyms are the stuff of word play. This kind of material presents a lode of pun possibilities. Or is that *load*? I had better go back and study.

Spelling varies its requirements of the user. Sometimes it is looking for the number of a multiple-choice question. At other times it asks you to type out a word that is correct for the context. For example, "Our football players _____ more than theirs (way or weigh)." Then, taking its cue from the letters *eigh* in weigh, the program segues to a question about *eight* and *ate*.

We got all the way through the Homonyms: A Sounds lesson. My son agreed to try another tape, but became disinterested when the narrator strove to breathe life into the rules that determine the situations in which the letter I comes before E.

I liked these programs more than did my son (whom I awoke, untied, and permitted to depart). But the fact that he was not very keen on them is indicative of the potential of this set in a classroom environment; it presents complete information in an easy-to-learn—if not captivating—form. When kids have trouble adding suffixes correctly, for example, they can get help from one of two suffix lessons. Moreover, students expect to work rather than be entertained at school, where they will adapt quickly to this series. At home, an educational program must be more entertaining in order to maintain interest. Chances are, most parents will encounter the same reaction I did.

This isn't criticism. In fact, I've grown weary of software that is intriguing at the expense of educational value. To paraphrase an adage, you can't be all things to all students. Sometimes the best way for a student to learn is to buckle down and study the hard way. However, the Spelling lessons are not all cod-liver oil, either. By combining text, narration, pictures, and user choices, they offer a diversity that helps to make the information they present more palatable to youngsters.

Dorsett offers numerous educational packages, which cost $59.95 for the 16 half-hour lessons they each contain. This price is more than reasonable. The Spelling series comprises the following lessons: Plurals of Nouns; Plurals of O and Y Nouns; Irregular Plurals; Changing Y to I Suffixes; Dropping the Silent E; The I Before E Rule; Doubling Consonants, Short Vowels; Doubling Consonants Before Suffixes; Adding Suffixes; Apostrophes; Homonyms: Contractions; Homonyms: A Sounds; Homonyms: E Sounds; Homonyms: I, O, U Sounds; Homonyms: Consonants; and Spelling Demons. The last lesson offers mnemonic tricks for remembering irregular spellings, such as secretary and calendar.

If you think that these programs will cause a string of comic-book Z's to rise above your head, then wake up and think again. Dorsett has put together an educational package that presents a well-conceived approach to ridding kids of confusion about spelling rules. It might even clear up a few things for some adults, *two*. ■

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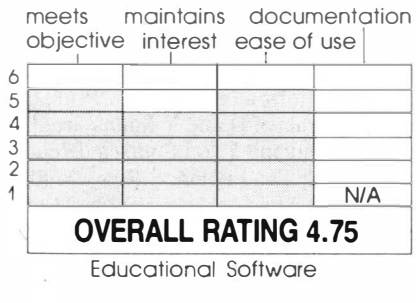
An Introduction to Personal Finance

by Stuart Hawkinson



Personal Finance is a series of 16 educational programs on eight cassettes for adults of all ages. It is available from Dorsett Educational Systems Inc., P.O. Box 1226, Norman, OK 73070, 800-654-3871, 405-288-2301 in OK. It requires 16K and comes on cassette. Personal Finance sells for $59.90

Personal Finance is an audio home-finance tutorial that takes advantage of the Color Computer's capable hardware. The series provides basic information and quizzes on the subjects of home budgeting, taxes, loans, investments, and insurance. The presentation combines text, graphics, and audio material smoothly, using a mix of questions in multiple-choice and one-word-response formats.

Personal Finance covers a wide range of personal-finance topics. The subjects are presented at about the high-school level and could supplement a personal-finance course. Lessons on planning a personal budget are followed by an elementary discussion of basic economic theory. One lesson covers income-tax preparation and planning. Borrowing, credit, loans, and real-estate mortgages make up four lessons. Plans for life, property, and health insurance are each addressed by their own lessons. The final section of the package contains five lessons on saving money and investments, including stocks and bonds, securities trading, and various investment funds.

The lessons are uniformly presented at the introductory level. You will not get extensive help for preparing income-tax forms or learning about the latest investment fads and shelters. However, you will get a comprehensive review of the fundamentals.

You start a session by loading and executing a machine-language driver. The program will not run while there is a ROM pack or disk controller in the expansion port. Loading and startup take less than a minute. Thereafter, the program controls the cassette player—loading text and graphics, and feeding the audio to your monitor speaker. The two lessons on each cassette are on opposite sides. Normal playing time is 20 to 30 minutes, depending on your responses. The driver program is virtually "bullet proof" and needs to be loaded only once for a day's use. Pressing the break key will get a response to load a new tape, but you can also continue with the current lesson.

The drill questions, of which there are about 20 for each topic, reinforce the lesson material. The narration on the tape is perfectly synchronized to text and graphics, including frequent "right" and "yes" responses to correct answers. Like many tutorial programs, you must answer correctly to proceed. A wrong answer elicits an error tone and a screen containing the expected response. The multiple-choice questions are often easy, while the one-word-response answers are sometimes difficult to guess. The program has no tolerance for misspellings or errors in capitalization.

The driver program keeps a record of your right and wrong answers, presenting your score at the end of each lesson. Students can try to improve their scores by replaying a lesson cassette at a later time. This might motivate younger students, but teens and

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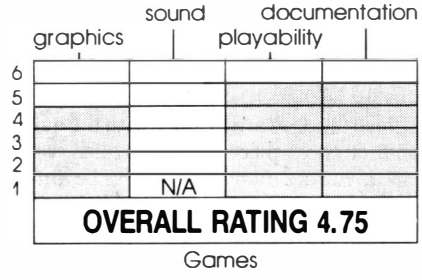
adults are not likely to go through the questions repeatedly.

As topics are presented, graphics illustrations and clever positioning of text keep the material interesting. The narration is well-organized and clearly delivered. I did not encounter speaking errors or poor usage. The graphics are good and the lettering is easy to read, but there is little variation in the colors used. Most screens are completely green, although there are also a few dark blue ones.

The Personal Finance package is professionally produced and worth serious consideration by teachers. Its beginner's level of presentation precludes the possibility of finding market tips or get-rich-quick schemes; that is not the aim of the series. Young adults will gain a good foundation in the basics of personal-money management through this series. Its 16 lessons offer a very complete introduction.■

Checking on ChesSD

by Terry Kepner



ChesSD was created by Software Dynamics and is distributed by Computer Systems Distributors, P.O. Box 9769, Anaheim, CA 92802, 714-772-1390. It requires 64K, Extended Color Basic, and a disk drive. It sells for $49.95 plus $2 for shipping.

If you have been waiting for a superior chess program, wait no longer. ChesSD is a disk-based program that stores almost 35,000 opening moves.

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Once loaded, ChesSD displays a high-resolution image of a chess board with all the pieces in place. While this isn't the most impressive chess display I've seen, it is more than adequate for its purpose—clear display of the individual chess pieces. Below the chess board is a comment line where the program provides messages relating to the state of the game, such as "thinking. . . ," "book move," or "Check!"

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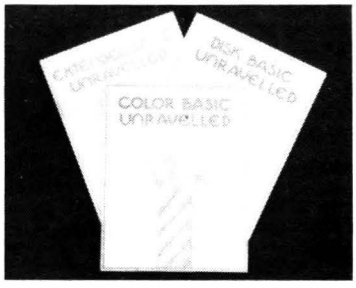

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All of the innermost operating processes are exposed. This book is an indispensable tool for the programmer seeking a full, in-depth knowledge of Basic. The Basic UNRAVELLED SERIES will make it easy for you to write your own Basic commands or modify Basic for whatever purpose you desire.

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point of view. The latter is based on a point scheme for pieces taken: pawns equal 100, knights and bishops equal 300, rooks equal 500, queens equal 900, and kings equal 20,000. A positive score indicates that the computer is winning; a negative score means that you are winning. Other statistics on the move table are an estimate by the program of how its next move will affect the score, the clock times for the two players, and a set of two numbers for the skill level the computer is set to play. The first of these is the level you set as the maximum number of moves it can "look ahead"; the second is the number of moves ahead it looked in considering its current move.

ChesSD is played using standard chess algebraic conventions. The rows are numbered from one to eight and the columns are labeled from A to H. ChesSD supports all the standard moves in chess, including castling, *en-passant* pawn capture, and pawn promotion to queen, rook, bishop, or knight. An unusual feature of the game is that it doesn't examine your king for check moves. If you accidentally move your king into check, ChesSD simply takes your king. According to the manual, this was done to make the program run faster.

There are six commands available to the ChesSD player. Newgame starts a new game. The skill option specifies the number of moves ahead the computer may look when searching for its next move (to a maximum of seven). Choosing tournament sets the program for timed tournament play. Selecting play instructs the computer to trade places with you and play your color. You use this command to tell the computer to play the white pieces instead of its default setting to black pieces. Entermoves sets the board to a predetermined arrangement, which is preset by manually entering the sequence of moves needed to play to that position. Although this is a time-consuming process, it is the only way to ensure that the board setup is correct. The last command is clearboard. You use it to clear the board of all pieces and assign positions to pieces for endgame or special chess problems.

Although it is a powerful chess program, ChesSD does have a few problems. There is no way to obtain a written record of the various moves played in a game. If you want a record you must write it down as you play. You also cannot save a game that is in progress. If you must leave an interesting game before completing it, you are out of luck unless you wrote down all moves as you played. But the largest shortcoming of ChesSD is that you cannot reverse a move. If, for example, you accidentally move into check and ChesSD takes your king, you cannot back up and replay the move. This last inconvenience will be especially apparent when experimenting with chess problems or exploring different strategies.

ChesSD's flexibility in letting you select the number of moves ahead it may look before moving a piece lets you tailor the game to your time and ability. The time required for the computer to calculate each move is fairly short, only about three seconds or less in the lower levels (one, two, and three). Moves in levels four, five, and six take the computer 30 seconds, three minutes, and 30 minutes, respectively. The seventh level is strictly for chess-by-mail fanatics. It requires five hours for each computer move. Tournament play usually takes place at level five.

All in all, ChesSD plays a mean game of chess—even at the lower levels—because of its extensive disk-based opening book. If you make the mistake of accidentally tapping into a sequence of moves in this book of plays, the computer's moves come quickly and are devastating. Although the game is not rated, it seems to have a playing strength of about 1,500. ChesSD is not a tutorial. It assumes that you are familiar with the movements of chess pieces and the rules of the game. If you are more than a chess beginner, ChesSD will give you a good run for your money. ■

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by William S. Bonnell

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Directory Assistance

Load, copy, and rename files from a disk directory.

System Requirements

32K RAM
Disk Extended Color Basic

One great feature of a disk-operating system is that it provides you with a disk's table of contents—the directory. Because you can see at a glance what a disk contains, it's easier to keep tabs on your files. But Disk Extended Color Basic doesn't fully exploit the directory's potential; you still have to remember command formats to copy, kill, rename, or load a file. File Directory lets you initiate these functions with one keystroke. It also sorts files alphabetically, dumps the sorted directory to a printer, lists an ASCII file on the screen, and protects 56 files per disk.

Program Operation

The program reads the directory of a disk and displays it in screens of 10 files. Statistics are displayed and the files are presented in alphabetical order by a machine-language sort. The arrow keys control the cursor. The left arrow moves you to the previous screen; the right arrow moves you to the next one. The down arrow moves the cursor to the next file; the up arrow moves it to the previous file. Holding the arrow keys down makes them autorepeat. The cursor wraps between the first and last screens and between the first and last files in each screen. Figure 1 shows a sample session.

Initiate operating-system commands by positioning the cursor next to the file and typing the appropriate letter:

A—Re-sorts the directory. This is especially useful after you have renamed a file.
B—Reads the directory again. Use this command after inserting a different disk in the drive.
C—Copies the file to another disk.
D—Dumps the sorted directory to the printer.
H—Displays the help screen.
K—Kills the file. The program first asks for verification.
L—Lists a file in ASCII format.
P—Protects the disk by copying the file-allocation table and seven sectors of the directory to granule 68, allowing you to protect 56 files per disk. (The date is stored in the last 8 bytes of granule 68.) This option also restores information from granule 68 to its proper location in track 17. A submenu asks you whether you wish to protect or restore. Before restoration, the date of the last protection is displayed and you must confirm your desire to continue. If granule 68 contains information other than a previously saved directory, the program asks if it should continue with the protection function.
Q—Quits the program.
R—Renames the file. The program prompts you for a new name. If you press the enter key without typing a file name, the program ignores the rename command.

```
BANDY    .BAS  ■     SCREEN 1 OF
CALENDAR.BAS          2
CALGEN   .BIN       FILE 1 OF
CHANGADD.BAS          18
DSK->TAP.BAS        SPACE LEFT
EUCHRE2  .BAS         34 GRANS
FILES    .BAS
GREEK    .BAS
HARD7FA0.BIN
HARDCOPY.SRC
<==========options==========>
A B C D H K L P Q R X ARROWS
```

Fig. 1. Sample Session

X—Loads and executes a machine-language file or loads and runs a Basic file. Exercise caution with machine-language files. If they overlay the file-management program, they might not execute. End Basic programs with RUN"File Directory", instead of STOP or END, to return control to the file manager. In this way, you can create a menu-driven disk.

Program Techniques

It is worthwhile pointing out some of the techniques I used in File Directory. Line 30 checks to see if the machine-language program has already been loaded. Lines 100–230 read the disk directory into an array called NA$( ). Line 280 creates a command string that is decoded in line 410 to branch control to the appropriate code. This is an excellent way to create a menu without excessive use of IF statements.

The FOR. . .NEXT loop in line 390 implements autorepeat by putting &HFF into the keyboard rollover table. EXEC 44539 is an efficient way of halting program execution until a key is pressed. POKE &HFF40 in line 730 stops the disk drive to allow the user to exchange disks. Line 980 shows how to run a program whose name is a variable. Notice the use of double quotation marks. ■

William S. Bonnell is an industrial engineer who specializes in simulation. Address correspondence to him at 239 Mason Ave., Rochester, NY 14626. Please enclose a stamped, self-addressed envelope for his reply.

Program Listing. File Directory

```
10 CLEAR 2000
20 T$="************************
       *FULL SCREEN DIRECTORY*
       *      COPYRIGHT      *
       *BILL BONNELL 11/08/84*
       ************************ "

30 CLS:IF PEEK(&HE002)=1900 THEN 6
0
40 GOSUB 1470:PRINT@263,"DIRECTI
ONS(Y/N)";
50 A$=INKEY$:IF A$="Y" THEN 1530
 ELSE IF A$<>"N" THEN 50
60 CLS:PRINT@164,T$:PRINT"
  reading directory"
70 PRINT@164,T$
80 DIM NA$(600)
90 '
100 'READING DIRECTORY
110 TRACK = 17
120 FOR S= 3 TO 11
130 DSKI$F,17,S,A$,B$
140 A$=A$+LEFT$(B$,127)
150 FOR P= 1 TO 255 STEP 32
160 NAME$= MID$(A$,P,8)
170 EXT$=MID$(A$,P+8,3)
180 IF EXT$<>"   "THEN EXT$="."+
EXT$:NAME$=NAME$+EXT$
190 IF LEFT$(NAME$,1)=CHR$(255)
THEN 240
200 IF LEFT$(NAME$,1)=CHR$(0) TH
EN 220
210 NA$(QQ)=NA$:QQ=QQ+1
220 NEXTP
230 NEXTS
240 GOSUB 1380 'SORT DIRECTORY
250 QQ=QQ-1:GR=FREE(0) '#FILES
260 NS=INT(QQ/10+1)-1 '#SCREENS
270 CS=0 'CURRENT SCREEN
280 CM$=CHR$(8)+CHR$(9)+CHR$(10)
+CHR$(94)+"KRCHLAPQXBD" 'COMMAND
 STRING
290 L=0:OL=0 'LINE:OLDLINE
300 A$=INKEY$:CLS:FOR I=CS*10+0
TO CS*10+9
310 PRINT NA$(I)
320 NEXT
330 PRINT @20,"SCREEN"CS+1"OF";
340 PRINT @52,NS+1;
350 PRINT@320,"<==========optio
ns==========>";
360 PRINT@352,"A B C D H K L P Q
 R X ARROWS"
370 PRINT@148,"SPACE LEFT":PRINT
@180,GR"GRANS";
380 POKE &HFF40,0
390 FOR KT=338 TO 345:POKE KT,25
```

```
5:NEXT:A$=INKEY$:PRINT @L*32+15,
CHR$(143);:PRINT@L*32+15,CHR$(12
8);:PRINT @ 84,"FILE"CS*1Ø+L+1"O
F ";:PRINT@116,QQ+1;:IF A$="" TH
EN 39Ø
4ØØ PRINT @L*32+15,A$;
41Ø ON INSTR(1,CM$,A$)+1 GOTO 39
Ø,43Ø,44Ø,47Ø,52Ø,58Ø,65Ø,73Ø,77
Ø,84Ø,94Ø,1Ø3Ø,162Ø,97Ø,163Ø,164
Ø
42Ø GOTO39Ø
43Ø CLS:CS=CS-1:IF CS<Ø THEN CS=
NS:GOTO 29Ø ELSE GOTO 29Ø'LEFT A
RROW
44Ø CLS:CS=CS+1:IF CS>NS THEN CS
=Ø:GOTO 29Ø ELSE GOTO 29Ø'RIGHT
ARROW
45Ø '
46Ø 'DOWN ARROW
47Ø L=L+1
48Ø IF L>9 OR CS*1Ø+L>QQ THEN L=
Ø
49Ø PRINT@OL*32+15,CHR$(143);:OL
=L:GOTO 39Ø'DOWN ARROW
5ØØ '
51Ø 'UP ARROW
52Ø L=L-1
53Ø IF L<Ø THEN L=9
54Ø IF CS*1Ø+L>QQ THEN L=QQ-CS*1
Ø
55Ø PRINT@OL*32+15,CHR$(143);:OL
=L:GOTO 39Ø
56Ø '
57Ø 'KILL AND RESORT
58Ø PRINT@448,"KILL "NA$(CS*1Ø+L
)" (Y/N)?";
59Ø A$=INKEY$
6ØØ IF A$="Y" THEN KILL NA$(CS*1
Ø+L):NA$(CS*1Ø+L)="":GOTO 24Ø
61Ø IF A$="N" THEN PRINT@448,"":
GOTO39Ø
62Ø '
63Ø 'RENAME
64Ø GOTO 59Ø
65Ø PRINT@448,"";:INPUT"NEW NAME
 OR ENTER";A$:IF A$="" THEN 3ØØ
66Ø PS=INSTR(A$,"."):IF PS=Ø THE
N PS=INSTR(A$,"/")
67Ø IF PS=Ø THEN 65Ø
68Ø A$=LEFT$(MID$(A$,1,PS-1)+"
      ",8)+MID$(A$,PS)
69Ø RENAME NA$(CS*1Ø+L) TO A$:NA
$(CS*1Ø+L)=A$
7ØØ GOTO 3ØØ
71Ø '
72Ø 'COPY FILE
73Ø PRINT@448," COPYING ";NA$(CS
*1Ø+L);:COPY NA$(CS*1Ø+L):CLS:PO
KE &HFF4Ø,Ø:PRINT"INSERT SOURCE
DISK...HIT ANY KEY":EXEC44539:GO
TO 29Ø
74Ø GOTO29Ø
75Ø '
76Ø 'HELP
77Ø CLS
78Ø PRINT" A AGAIN  - RESORT THE
 DIRECTORY B BEGIN  - REREAD THE
 DIRECTORY C COPY   - COPY TO OT
HER DISK   D DUMP   - PRINT SORT
ED DIR.    H help   - DISPLAY TH
IS SCREEN  K KILL   - DELETE FRO
M DISK     L LIST   - LIST AN AS
CII FILE"
79Ø PRINT" P PROTECT- COPY DIR/F
AT TO GR68 Q QUIT   - END THE PR
OGRAM      R RENAME - RENAME FIL
E          X EXEC   - RUN A PROG
RAM        ^ ARROW  - PREVIOUS F
ILE        V ARROW  - CURSOR TO
NEXT FILE  <-ARROW  - SELECT PRE
V. SCREEN"
8ØØ PRINT" ->ARROW  - SELECT NEX
T SCREEN";
81Ø PRINT@48Ø," HIT ANY KEY TO C
ONTINUE";:EXEC 44539:GOTO 3ØØ
82Ø '
83Ø 'LIST AN ASCII FILE
84Ø CLS
85Ø OPEN "I",1,NA$(CS*1Ø+L)
86Ø SW=EOF(1)
87Ø IF SW THEN CLOSE:PRINT:PRINT
"HIT ENTER TO CONTINUE":EXEC4453
9:CLS:GOTO 3ØØ
88Ø LINEINPUT #1,A$:PRINT A$
89Ø A$=INKEY$:IF A$="" THEN 86Ø
9ØØ IF A$="Q" THEN SW=1:GOTO87Ø
91Ø EXEC44539:GOTO 86Ø
92Ø '
93Ø 'RESORT DIRECTORY
94Ø GOSUB 138Ø:GOTO 3ØØ
95Ø '
96Ø ' RUN BASIC OR EXEC ML
97Ø PRINT @448,"EXECUTE "NA$(CS*
1Ø+L);
98Ø IF RIGHT$(NA$(CS*1Ø+L),3)="B
AS" THEN RUN ""+NA$(CS*1Ø+L)
99Ø IF RIGHT$(NA$(CS*1Ø+L),3)="B
IN" THEN LOADM""+NA$(CS*1Ø+L):EX
EC:GOTO 3ØØ
1ØØØ PRINT"WRONG FILE TYPE...HIT
 A KEY":EXEC 44539:GOTO 3ØØ
1Ø1Ø '
1Ø2Ø 'GET OR SAVE DIRECTORY
1Ø3Ø CLS
1Ø4Ø PRINT "pROTECTION MENU"
1Ø5Ø PRINT "1 SAVE DIRECTORY TO
GRAN 68"
```

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```
106Ø PRINT "2 GET DIRECTORY FROM
 GRAN 68
107Ø INPUT "ENTER 1 OR 2";A
108Ø ON A GOTO 111Ø,127Ø
109Ø GOTO 103Ø
11ØØ 'SAVE DIRECTORY TO GR68
111Ø INPUT"ENTER DATE(MM/DD/YY)"
;DA$
112Ø DSKI$Ø,17,2,A$,B$
113Ø IF MID$(A$,68,1)=CHR$(&HC9)
 THEN 116Ø
114Ø IF MID$(A$,68,1)=CHR$(&HFF)
 THEN 116Ø
115Ø PRINT"GRAN 68 IN USE...CONT
INUE(Y/N)":INPUT Z$:IF Z$="Y" TH
EN 116Ø ELSE 3ØØ
116Ø MID$(A$,68,1)=CHR$(&HC9)
117Ø DSKO$ Ø,17,2,A$,B$
118Ø DSKO$ Ø,34,11,A$,B$
119Ø FOR DS=3 TO 9
12ØØ DSKI$ Ø,17,DS,A$,B$
121Ø IF DS=9 THEN MID$(B$,12Ø,LE
N(DA$))=DA$
122Ø DSKO$ Ø,34,DS+9,A$,B$
123Ø NEXT DS
124Ø MID$(B$,12Ø,8)=DA$
125Ø GOTO3ØØ
126Ø 'GET DIRECTORY FROM GR68
127Ø DSKI$ Ø,34,18,A$,B$
128Ø DA$=MID$(B$,12Ø,8)
129Ø PRINT "DATE LAST SAVED WAS
"DA$
13ØØ INPUT"CONTINUE RESTORE(Y/N)
";A$:IF A$<>"Y" THEN 3ØØ
131Ø FOR DS=2 TO 9
132Ø DSKI$Ø,34,DS+9,A$,B$
133Ø DSKO$ Ø,17,DS,A$,B$
134Ø NEXT DS
135Ø GOTO 3ØØ
136Ø '
137Ø 'ML SORT ROUTINE (BILL BARD
EN - JUN.82 TRS8Ø MICROCOMPUTER
NEWS P.13 MODIFIED BY ME)
138Ø A=Ø:NN=Ø
139Ø DEFUSRØ=&HØEØ2
14ØØ NN=VARPTR(NA$(Ø))
141Ø POKE &HØEØØ,INT(NN/256)
142Ø POKE &HØEØ1,NN-INT(NN/256)*
256
143Ø A=USRØ(Ø)
144Ø RETURN
145Ø '
146Ø 'ML SORT LOADER
147Ø PRINT"LOADING MACHINE LANGU
AGE SORT":FOR ADDR=&HØEØ2 TO &HØ
E68:READ A$:POKE ADDR,VAL("&H"+A
$):CK=CK+VAL("&H"+A$):NEXT
148Ø IF CK<>1Ø8Ø5 THEN PRINT"ERR
OR IN TYPING ML SORT":STOP
149Ø DATABE,ØE,ØØ,34,1Ø,EE,E4,AE
,5E,3Ø,1F,4F,34,12,A6,C4,27,2A,A
6,C4,E6,45,AØ,45,24,Ø2,E6,C4,34,
Ø1,AE,42,1Ø,AE,47,6D,45,26,Ø4,32
,61,2Ø,29,A6,8Ø,AØ,AØ,27,Ø4,32,6
1,2Ø,Ø5,5A,26,F3,35,Ø1,23,18,AE,
42,1Ø,AE,47,AF,47,1Ø,AF,42,A6,C4
,E6,45,E7,C4,A7,45,EA,45
15ØØ DATAEA,E4,E7,E4,33,45,AE,61
,3Ø,1F,AF,61,26,BØ,A6,E4,32,63,2
6,A1,32,62,39
151Ø RETURN
152Ø '
153Ø '
154Ø 'DIRECTIONS
155Ø CLS
156Ø PRINT" THIS PROGRAM WILL PR
ESENT THE   CONTENTS OF YOUR DIS
K SORTED    IN BLOCKS OF 1Ø FILE
S.  YOU     MAY TYPE IN COMMANDS
 NEXT TO    THE FILE SUCH AS KIL
L, COPY     OR RENAME.  THESE WI
LL ACT ON   THE ADJACENT FILE."
157Ø PRINT:PRINT" YOU MAY ALSO T
YPE IN CERTAIN    COMMANDS WHICH
 WILL CHANGE THE  VIEW.  FOR EXA
MPLE HELP, QUIT   AGAIN OR THE A
RROW KEYS.  HELP  WILL GIVE YOU
THE SPECIFIC      ACTIONS FOR EA
CH KEY."
158Ø PRINT:PRINT"HIT A KEY TO CO
NTINUE";:EXEC44539:CLS
159Ø PRINT" THE PROGRAM CONTAINS
 A MACHINE  LANGUAGE SORT AND AU
TO REPEAT   KEY FOR CURSOR AND S
CREEN       MOVEMENT.  THE PROTE
CT FEATURE  WILL STORE AND RETRI
EVE THE     FILE ALLOCATION TABL
E AND DIR.  TRACKS TO GRAN 68."
16ØØ PRINT:PRINT" BECAUSE ONLY 1
 GRAN (68) IS    USED FOR PROTE
CTION, THE      NUMBER OF FILE
S IS LIMITED TO   LESS THAN 56 F
ILE/DISK."
161Ø PRINT:PRINT"HIT A KEY TO CO
NTINUE";:EXEC44539:CLS:GOTO 6Ø
162Ø CLS:STOP 'QUIT COMMAND
163Ø RUN 'READ DIRECTORY AGAIN
164Ø 'HARDCOPY
165Ø PRINT @416,"ENTER TITLE OF
DIRECTORY":INPUT TI$
166Ø PRINT #-2,TI$
167Ø FOR I=Ø TO QQ:PRINT#-2,NA$(
I)"    "
168Ø NEXT
169Ø PRINT #-2
17ØØ GOTO 3ØØ
```

END

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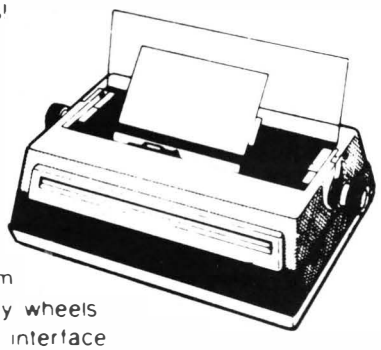

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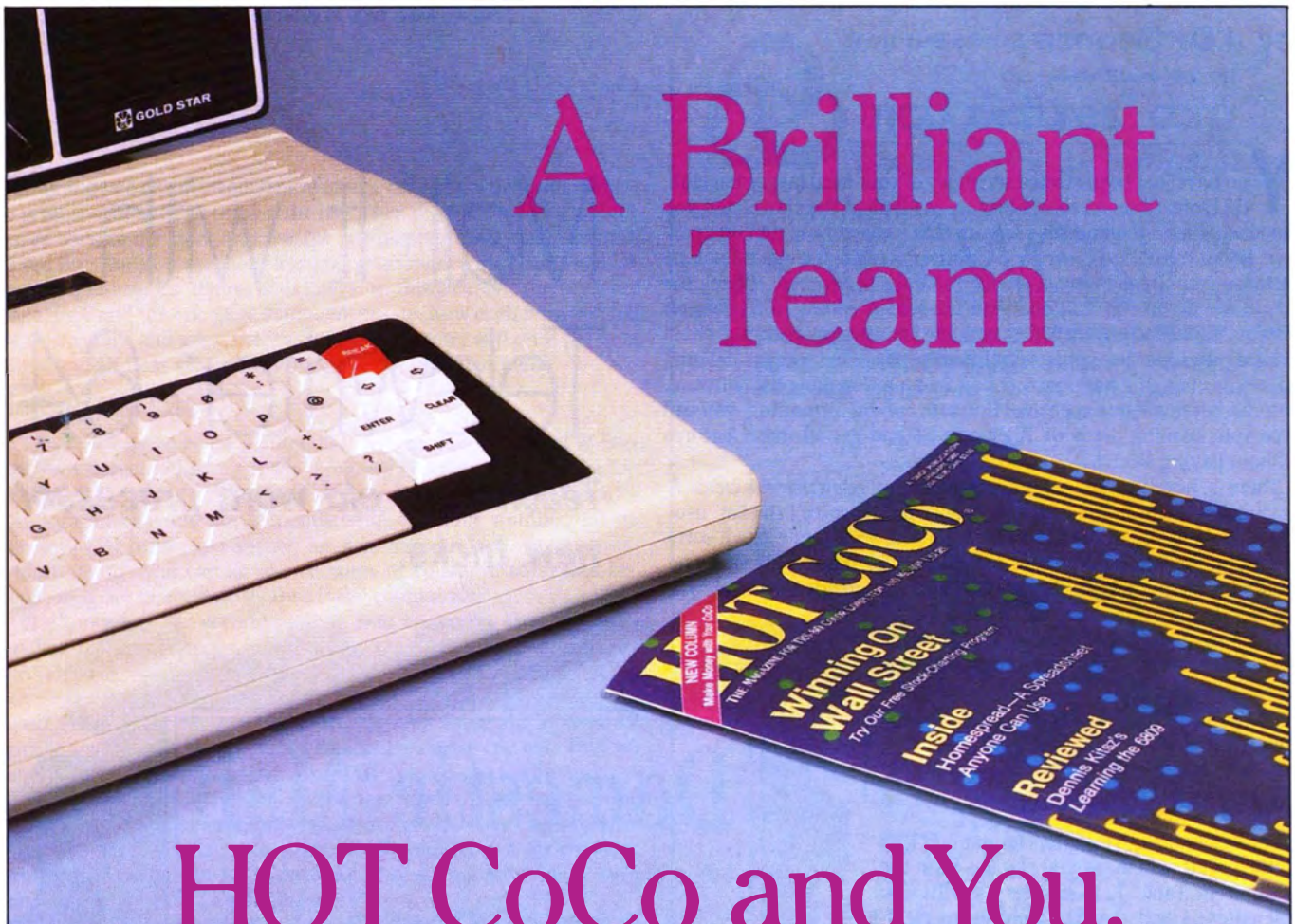

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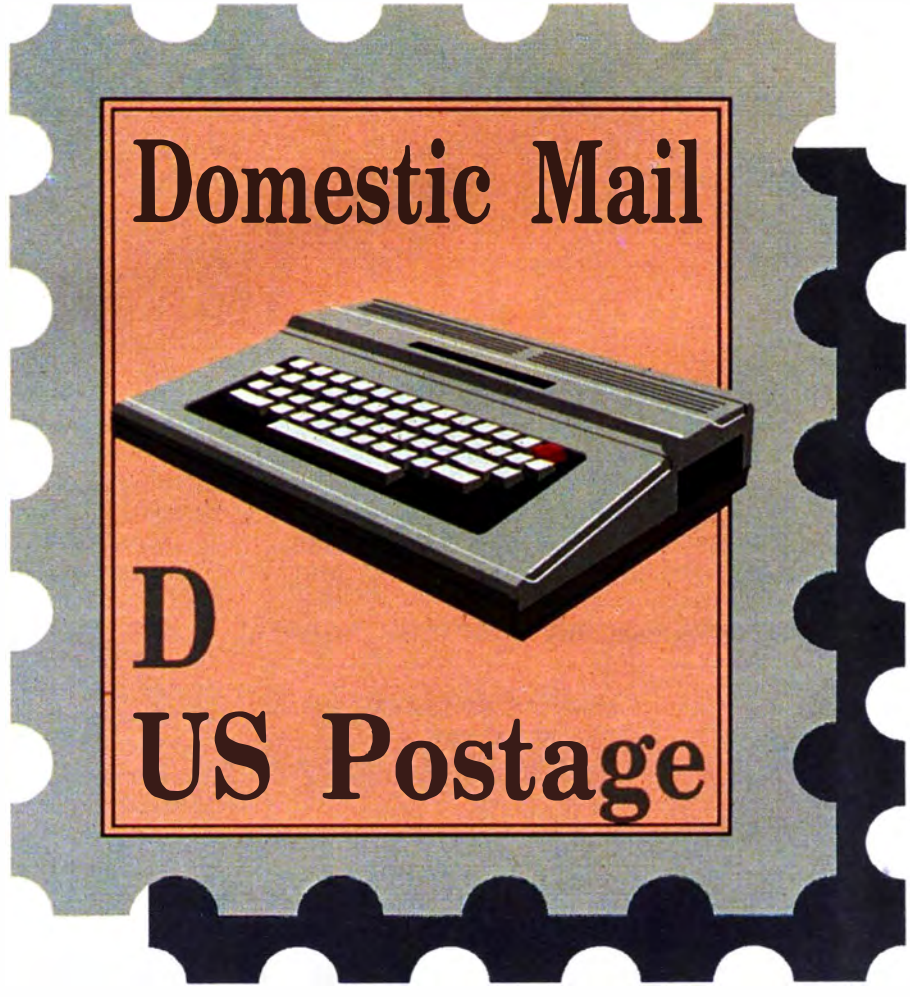
by J.D. German

Mail It with Telewriter-64

Teach your old word processor new tricks.

You have just been elected secretary of your local (a) garden club, (b) Lions Club, (c) soccer league, or (d) all of the above, and you are looking for a mailing-list program that's easy to use and inexpensive. If you have the Telewriter-64 word-processing program, look no further—you already have a terrific mailing-list program. Check the ads to see if you can find one with full-screen editing, a 51-column display, imbedded printer codes, variable line spacing, merging, chain printing for long lists, plus search and replace features for deleting names or changing addresses. If you find such mailing-list software, you can bet it will be expensive. But with careful formatting, you can type your mailing list with Telewriter-64 and get all these features without paying a cent.

There is, however, one essential feature that Telewriter-64 lacks. A mailing list program must be able to sort and rearrange the list, usually alphabetically by last name or according to zip code. Such sorts are useful for finding duplicate entries and for postal bulk-rate presorting. With the ASCII Save/Read-In program provided with Telewriter and the program described in this article, you can easily sort your mailing list by name, zip code, or—with simple program modifications—by membership number, shoe size, hair color, or any other item you want to include in your mailing list.



Typing the Mailing List

The key to using Telewriter for mailing lists is the format, which, as you can see from the example in Table 1, is simple. As with any Telewriter-64 text that you don't want right- and left-justified, you must use a caret semicolon (^;) for the beginning and ending lines. The second line is used for the mailing-list title, which must be preceded by a caret T (^T)—the code for a nonprinting comment. Finally, after the title line and between each name-and-address block, you must type a caret N (^N). This advances the printer to the next mailing label when the list is printed.

Using this format, a 32K Color Computer with Telewriter-64 has room for 200 to 300 names per mailing list, depending on the average length of the names and addresses. A 16 or 64K computer would hold correspondingly shorter or longer lists. Fortunately, Telewriter-64 has provisions for chain printing any number of files, so this maximum is not really restrictive. For a list of 1,000 names, for example, you could quickly presort the names into those beginning with the letters A–G, H–M, N–S, and T–Z; type them as four lists; sort each one; and chain print them.

Printing the Mailing List

The Telewriter format menu offers several choices that are useful for printing mailing lists. The most common printing requirement is to put each name and address on a separate mailing label. For the standard $1\frac{5}{16}$-inch labels (1-inch spacing from label to label), set the printer for six lines per inch and the Telewriter-64 format menu to six lines per page. You will probably also want to set the left margin to five. With the one-line format-menu choice set at zero, the entire mailing list will be printed at once. For larger or smaller labels, set the lines per page on the format menu to the appropriate number.

The printing sequence is flexible. If you would like to use sheets

System Requirements

16K RAM
Disk Drive
Disk Extended Color Basic
Telewriter-64
Printer

containing two or three columns of labels, use the partial-print feature to print the first half or third of the list. Then reset the margin, roll the paper back to the start, and use the partial print for the next portion of the list. Another variation lets you print names and addresses directly on envelopes, flyers, or catalogs. In this case, set the lines per page to 66 and the one-page statement to one. Now each time you roll in an envelope and press the break key, the printer will print the next name and address and roll the envelope out into your hand.

Sorting the List

To sort a Telewriter-64 mailing list, type in and save the TW Sort program shown in Listing 1. The program is designed for the list format given in Table 1. If your mailing list requires a different format—an extra address line for a membership or phone number, for instance—refer to the last section for help in modifying the program. Unfortunately, you cannot use commas or colons in addresses because they are interpreted as Disk Basic commands.

The procedure for sorting mailing lists is simple. First, type the mailing list in the proper format using Telewriter-64; then return to the Telewriter-64 menu and enter Basic by pressing B. Load the ASCII Save/Read-In program provided with Telewriter-64. Put a newly formatted disk in the drive and save the mailing list as ASCII code. Be sure to use the file name, SORT ML, when saving the list. Turn off and restart the computer; then load and run TW Sort. The program prompts you to press the play button and select the sort method. Go watch a football game or your favorite video movie. (More on sort times later.) When the sort is finished, the program offers you the choice of printing the sorted list for a quick check or saving it to disk. Follow the prompts to save the sorted list on disk.

Now, reload Telewriter-64 and the ASCII Save/Read-In program as before. Read in the sorted mailing list, which is now called SORTEDML. Return to Telewriter-64's edit mode and check the list to be sure it is still properly formatted. Then return to the Telewriter-64 menu and save the sorted list on another disk in the normal (non-ASCII) Telewriter-64 file format. This will make it easy to load and use later without the ASCII Save/Read-In program. You can now print labels, periodically update the list, or pass it along to the next person that gets stuck with the secretary's job.

```
^;
^T Club Mailing List
^N
John Doe
123 Fourth Street
New York NY 10102
^N
Mary Smith
987 Main Street Apt. #4
Miami FL 35508
^N
Bill Jones
55 Washington Ave.
Dallas TX 75234
^N
Pat Hill
P.O. Box 456
Los Angeles CA 98240
^N
J. C. Nickel
Route #1 Box 76
Ojo Caliente NM 87649
^;
```

Table 1. Example of Proper Format for Original (Unsorted) Mailing List

The Sorting Program

TW Sort is designed so that you can easily adapt the format to your needs. Each section of the program is labeled to show its function, and the structure follows—as much as possible—a logical order. To see how you can modify the program, let's add a membership-number line above each name.

First, you must dimension a new variable, call it MEMNUM$, in line 15. Change the input routine to read four lines per address block by changing the 3 in line 1025 to a 4. Next, add a new membership-number sort routine after the zip-sort routine. Since the first line of each list item would contain only the membership number, you don't need a subroutine to separate that number as you do with the last-name and zip sorts. Simply write program lines to compare each membership number with the oth-

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ers. (Lines 2525–2560 perform this function for the zip codes.) Finally, write PRINT statements for MEMNUM$(I) in the print-sorted-list and save-sorted-list routines.

In an effort to keep the program short and simple, I used a rather primitive sorting technique. As a result, the sorting times get long for large lists—over two hours for 250 names. But since you don't have to perform sorts frequently, this shouldn't be a severe shortcoming. If none of the zip codes you use contains nine digits, delete line 210 to speed up the sort.

Two final notes on the TW Sort program. If you have an early version of the CoCo, you might have the ROM (read-only memory) version with the PCLEAR bug in it. If you get only an OK prompt when you run TW Sort, type RUN again. You can also omit all comment lines to reduce your typing. The GOTOs and GOSUBs transfer control to the line following the comment, so the program runs with or without the comments.■

Address correspondence to J.D. German, Creative Technical Consultants, Box 652, Cedar Crest, NM 87008.

Program Listing. TW Sort.

```
10 PCLEAR1:CLEAR 16000
15 DIM NAME$(250),ADDR$(250),CSZ
$(250)
20 CLS
30 GOTO 7010
100 '***SUBROUTINES***
110 '***LAST NAME SEPARATOR***
120 Z=LEN(N$)
130 FOR K=1 TO Z
140 LN$=RIGHT$(N$,K)
150 IF LEFT$(LN$,1)=" " THEN LN$
=RIGHT$(LN$,K-1) ELSE NEXT K
160 RETURN
180 '***ZIP SEPARATOR***
200 ZIP$=RIGHT$(CSZ$,5)
210 IF LEFT$(ZIP$,1)="-" THEN ZI
P$=RIGHT$(CSZ$,10)
220 IF VAL(ZIP$)=0 THEN ZIP$=""
230 RETURN
250 '***INKEY$***
260 PRINT@483,"press any key to
continue";
270 SOUND 150,2:SOUND 50,2
280 A$=INKEY$
290 IF A$=""THEN280 ELSE RETURN
295 '
300 PRINT@483, "press 1 or 2 to
continue";
310 SOUND 50,2:SOUND 150,2
320 CH$=INKEY$:CH=VAL(CH$)
330 IF CH=1 OR CH=2 THEN RETURN
ELSE 320
340 '***END OF SUBROUTINES***
350 '
1000 '***MAILING LIST INPUT***
1010 OPEN "I",#1,"SORT ML"
1015 INPUT#1,CC$,TITLE$,NP$
1017 PRINT"MAILING LIST TITLED"
1018 PRINT RIGHT$(TITLE$,LEN(TIT
LE$)-3)
1019 PRINT"IS NOW BEING SORTED"
1020 EL=1
1025 FOR RL=1 TO 3
1030 IF EOF(1) THEN CLOSE#1:EL=E
L-1:GOTO 3505
1040 INPUT #1,L$(RL)
1050 IF LEFT$(L$(RL),1)="^" THEN
 1025 ELSE NEXT RL
1060 IF RIGHT$(L$(1),1)=" " THEN
L$(1)=LEFT$(L$(1),LEN(L$(1))-1):
GOTO1060
1070 IF RIGHT$(L$(3),1)=" " THEN
L$(3)=LEFT$(L$(3),LEN(L$(3))-1):
GOTO1070
1080 ON CH GOTO 2010,2510
2000 '***LAST NAME SORT***
2010 IF EL=1 THEN I=1:GOTO 3050
2020 N$=L$(1):GOSUB 120
2030 CN$=LN$
2040 FOR I=1 TO EL-1
2050 N$=NAME$(I):GOSUB 120
2060 IF CN$>=LN$ THEN NEXT I
ELSE 3000
2070 I=EL:GOTO 3050
2500 '***ZIP SORT***
2510 IF EL=1 THEN I=1:GOTO 3050
2520 CSZ$=L$(3):GOSUB 200
2525 CZ$=ZIP$
2530 FOR I=1 TO EL-1
2540 CSZ$=CSZ$(I):GOSUB 200
2550 IF CZ$>=ZIP$ THEN NEXT I
ELSE 3000
2560 I=EL:GOTO 3050
2990 '***NAME REORGANIZER***
3000 FOR J=EL TO I+1 STEP -1
3010 NAME$(J)=NAME$(J-1)
3020 ADDR$(J)=ADDR$(J-1)
3030 CSZ$(J)=CSZ$(J-1)
3040 NEXT J
3050 NAME$(I)=L$(1)
3060 ADDR$(I)=L$(2)
3070 CSZ$(I)=L$(3)
3090 EL=EL+1
3100 GOTO 1025
3500 '***SORTED LIST MENU***
3505 CLS
3510 PRINT@3,"sort complete-what
 next?"
3520 PRINT@96,"1> PRINT SORTED M
AILING LIST."
3530 PRINT@192,"2> STORE SORTED
MAILING LIST       ON DISK IN AS
CII FORMAT."
3540 GOSUB 300
3550 ON CH GOTO 4010,5010
4000 '***PRINT SORTED LIST***
4010 FOR I=1 TO EL
4020 PRINT#-2,NAME$(I)
4030 PRINT#-2,ADDR$(I)
4040 PRINT#-2,CSZ$(I)
4045 PRINT#-2
4050 NEXT I
4060 GOTO 3505
5000 '***SAVE SORTED LIST***
5010 CLS
5020 PRINT@3,"to save sorted mai
ling list"
5030 PRINT@64,"A> INSERT DISK FO
R SAVING NEW       FILE."
5050 PRINT@128,"B> PRESS ANY KEY
 TO START SAVE"
5060 PRINT@192,"C> SORTED MAILIN
G LIST WILL BE     SAVED IN ASCI
I FORMAT AS        FILE NAME 'SO
RTEDML'."
5070 PRINT@288,"D> TO EDIT, RENA
ME OR SAVE IN      TW BINARY FOR
MAT, INPUT LIST    TO TELEWRITER
 USING ASCII           READ-IN PR
OGRAM."
5080 GOSUB 260
5100 OPEN "O",#1,"SORTEDML"
5110 PRINT#1,CC$
5120 PRINT#1,TITLE$
5125 PRINT#1,NP$
5130 FOR I=1 TO EL
5140 PRINT#1,NAME$(I)
5150 PRINT#1,ADDR$(I)
5160 PRINT#1,CSZ$(I)
5170 IF I<EL THEN PRINT#1,NP$
5180 NEXT I
5190 PRINT#1,CC$
5200 CLOSE#1
5210 CLS
5220 PRINT"SORTED MAILING LIST I
S SAVED.   PRESS ANY KEY TO RETU
RN TO THE  LAST MENU."
5230 GOSUB 260:GOTO 3505
7000 '***INSTRUCTIONS***
7010 PRINT@ 6,"tw sort instructi
ons"
7020 PRINT@32,"1> USE TELEWRITER
 TO CREATE A       MAILING LIST I
N THIS FORMAT:"
7030 PRINT@100,"^;"
7040 PRINT@132,"^T CLUB MAILING
LIST"
7045 PRINT@164,"^N"
7050 PRINT@196,"JOHN A. DOE"
7060 PRINT@228,"123 FIRST STREET
"
7070 PRINT@260,"ALBUQUERQUE, NM
87908"
7080 PRINT@292,"^N"
7090 PRINT@324,"JANE SMITH"
7100 PRINT@356,"2468 MAIN STREET
"
7110 PRINT@388,"AURORA, IL 60516
"
7120 PRINT@420,"^;"
7130 PRINT"2> ASCII SAVE LIST AS
 'SORT ML'"
7140 GOSUB 260
7150 CLS
7160 PRINT@10,"to use tw sort"
7170 PRINT@64,"A> INSERT ASCII M
AILING LIST        DISK TO BE SOR
TED."
7180 PRINT@192,"B> SELECT SORT O
F OPTION 1 OR 2"
7200 PRINT@324,"1) NAME SORT"
7210 PRINT@356,"2) ZIP SORT"
7220 GOSUB 300
7230 CLS 0
7240 GOTO 1010
```

END

by Wade Jense

This program is available on our Instant CoCo cassette.
See the Instant CoCo ad elsewhere in this issue.

Halt Thief!

Listen to the clues to find the thief before your opponents.

Someone has committed a crime. You and your opponents are private detectives assigned to track down and arrest a thief. The detective who makes the arrest receives a reward. Your challenge—to be the first detective to accumulate enough reward money to win.

This thief is computer controlled and completely invisible. But you can hear him. Each time the thief makes a move on the board, he triggers a sound on your CoCo. This remarkable device follows every move the thief makes on the board so you can hear him in the very act of committing the crime, crossing a squeaking floor, opening a creaky door, or escaping on the elevators.

Each sound you hear on your CoCo provides you with a clue to the thief's location; with these, you can track him down. Use your CoCo to call the cops, direct them to the thief, and with a little luck, the cops will arrest him.

Loading

To load, type in the Listing. Check every line to be sure it agrees with the Listing. Count the number of items in each DATA statement to ensure the correct number for the required READ loops and DIM statements.

After you run the program and display the board, make sure the yellow, orange, and dark blue squares are lined up horizontally, vertically, and diagonally. If they don't line up, the program will not run correctly. Check the main body of DATA statements for errors.

The Board

The board is made of graphic character blocks POKEd onto the screen with two blocks making up each square space. The players' and thief's symbols displayed on the board cover only half of each space so you can see the color of the space you are on.

The green spaces represent walls that neither the player nor the thief can move onto or cross. The yellow and black spaces are empty; the players can move onto either of these areas, but the thief can only move on the yellow spaces. The orange spaces represent places where the thief might commit a crime and are treated as yellow spaces for movement purposes. The dark blue squares represent doors through which both the thief and the player can move. The light blue areas can cover one or more spaces and represent items such as checkout counters, desks, statues, and plants. Neither the thief nor the players can move onto these areas. The white spaces represent windows into which neither the thief nor the player can move. (See Table 1.)

In the top right and the bottom left corners of the board is the symbol EL, which represents the two elevators on each level. To use an elevator, position your character on the E of EL and press U for up or D for down. The CoCo reprints the screen to the level above or below you. Your present level (1–4) is printed in the bottom left corner of the screen.

Along the bottom is a line of information. If a question mark appears, it is your prompt to press a key. Next, in response to this, a "NO" or an "OK" appears on the subline. OK indicates that the CoCo can carry out the function of that key. The next item to appear is a two-character symbol representing the last sound clue given, and finally, the name of the current player, the amount of money he has, and the number of moves he has left.

Your Turn

At the beginning of your turn, the CoCo moves the thief and gives corresponding sound clues and a random number of moves from 1 to 12. You use one card per turn by pressing C. The CoCo clears the screen and displays your three cards. Press the number of the card you wish to use, and the CoCo carries out your wish. If you don't want a card, press five and the CoCo reprints the screen. You can use a card later; the CoCo replaces it with another random card.

Color	Rep.	Thief	Player
Green	Wall	N	N
Orange	Crime	Y	Y
Yellow	Empty	Y	Y
Black	Empty	N	Y
Dark Blue	Door	Y	Y
Light Blue	Items	N	N
White	Window	N	N
EL	Elevator	Y	Y

Table 1. Board Information

When you use a "tip" card, watch the screen carefully because the CoCo only displays a T (the thief's location) for a few seconds. After you use a "take another turn" card, the CoCo gives you more moves and a chance to use another card. On your turn you can use all, part, or none of your moves. When you press F to finish, the next player starts.

System Requirements

32K RAM
Extended Color Basic

Illustration by Dianne Ritson

Player Movement

Eight different keys let you move your symbols as follows: N moves north; T, northeast; E, east; V, southeast; S, south; Z, southwest; W, west; and Q, northwest. Seven other keys, including U and D, help you on your mission. R repeats the last clue, and X alternately prints the thief's and player's level. (See Tables 2 and 3.)

N	North
T	Northeast
E	East
V	Southeast
S	South
Z	Southwest
W	West
Q	Northwest
U	Up
D	Down

Table 2. Player Movements

A	Arrest
R	Repeat Clue
C	Use Card
X	Display Thief Level
X	Display Player Level
F	Finished
H	Help Table

Table 3. Player Functions

If the only item displayed on the subline is a question mark, press X until the complete subline is displayed. To make an arrest when you and the thief are on the same space, press A. The game uses a series of sound effects beginning with a siren. If you guess correctly and are on the same space and level as the thief, you hear shooting; if the police can catch the thief, you hear another siren. The CoCo then congratulates you and starts another thief on a spree of crimes.

If, however, the thief escapes, the CoCo sounds the getaway and five clues, moving the thief five times. You must listen carefully to get all five sound clues. If you mistake the location of the thief, the CoCo gives a low-pitched sound and punishes you for a false arrest by taking away $100 and all your remaining moves.

Difficulty Level	Number of Cards	Chances of Thief Escaping	Maximum Rolls	Reward	Money to Win
1	14	20%	12	$800	$2,000
2	12	25%	10	$700	$2,500
3	10	33%	8	$600	$3,000
4	6	50%	6	$500	$3,500

Table 4. Influence of Difficulty Level

Thief Movement

The CoCo only moves the thief in three circumstances: at the beginning of each player's turn and when a player uses a "take another turn" card, when a player uses a "take an extra clue" card, and when the thief gets away during an arrest. Every time the thief moves, the CoCo sounds a clue and prints the symbol on the subline. For every clue sounded, the thief moves two full spaces horizontally, vertically, or diagonally.

When the thief escapes an arrest, five clues sound, so he moves 10 spaces; for every use of an "extra clues" card, he moves two spaces per clue. When a thief moves, he never goes directly to his previous space, but may do so in two moves. The thief moves on every other space and is never found on a black space.

Four clues can appear on the subline. The first clue to appear in the game is CR, meaning the thief has just committed a crime and is on an orange space. When he has opened a door, DR appears on the subline and he is on a dark blue space. If the thief has just taken two steps across an open floor, SP appears and he is on a yellow space. You know that the thief is on one of the two EL spaces when EL appears on the subline.

When the thief uses an elevator the CoCo picks a random number to see if he goes up or down. He will always go from the first to second level or from the fourth to the third. The CoCo prints the thief's level and the current player's level. As long as the thief's level differs from the player's, the CoCo reprints the thief's level before giving the next clue.

Tracking the Thief

At any given moment, the thief might be at one of several locations. You must use your knowledge of where and when a thief moves, along with his previous location to determine where he might be.

When tracking the thief, watch every space that is exactly two spaces away from the thief's possible location. Remember also that the clues given during the other players' turns are just as important as the clue given during your turn. You can narrow the possibilities down to two or three if you don't know the thief's exact location.

Playing the Game

After displaying the help screens and prompting you to choose the level of difficulty, the CoCo asks for the name of each player. Submit a name containing three to eight characters. The program renumbers the names in a semirandom order, assigns a symbol to each name, and prints the renumbered names and the players' symbols for use on the board. The CoCo randomly assigns each player three cards and displays them for each player. The game starts on a randomly chosen floor. Finally, the CoCo places the thief on a random crime space, sounds the clue, and turns the keyboard over to the first player.

To start another game, press the Y key after a player has won the game or press the break key and type GOTO 58. For a longer game, choose a higher difficulty level. ■

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Program Listing. Halt Thief

```
2 '*        HALT THIEF II       *
6 CLS:FORL=29696TO3Ø2Ø7:POKEL,12
8:NEXT
7 POKE65478,Ø:POKE65481,Ø:POKE65
482,Ø:POKE65485,Ø:POKE65487,Ø:PO
KE65489,Ø:POKE65490,Ø
8 FORL=1TO11Ø
9 READST
1Ø POKE(ST+29696),255
11 SOUND55,1:NEXT
12 FORR=1TO2Ø
13 READV,Z
14 POKE(V+28674),Z
15 SOUND2ØØ,5:NEXT
16 DATA37,41,43,44,45,46,47,49,5
5,56,57,58,59,254,253,317,378,37
6,375,374,373,372,37Ø,369,368,36
7,366,364,36Ø,356,226,227,69,73,
75,79,81,89,252,251,316,315,346,
34Ø,336,332,328,324,292,26Ø,228,
229,165,133,1Ø1,1Ø2,1Ø3,1Ø4,1Ø5,
1Ø7,1Ø8,1Ø9,11Ø,111,113
17 DATA121,25Ø,282,314,311,31Ø,3
Ø9,3Ø8,3Ø4,3ØØ,299,298,297,296,2
3Ø,137,139,143,145,153,248,247,2
76,272,268,264,232,169,171,175,1
77,178,179,18Ø,181,185,246,245,2
44,242,241,24Ø,239,238,236
18 DATA14Ø3,9,14Ø4,9,1442,4Ø,144
3,3,1444,41,1446,49,1447,57,1448
,56,1449,52,1451,2,1452,25,1454,
23,1455,1,1456,4,1457,5,1459,1Ø,
146Ø,5,1461,14,1462,19,1463,5
19 FORLV=3Ø2Ø8TO32255
2Ø READ LE
```

```
21 POKELV,LE
22 NEXT
23 DATA 128,128,128,128,128,128,
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128,128,128,128,128,128,128,128,
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143,143,143,143,143,143,143,143,
143,143,143,143,143,143,143,143,
143,143,143,143,143,143,143
24 DATA 143,128,128,2,143,128,12
8,128,128,128,128,239,239,239,23
9,143,143,36,36,36,36,36,36,36,1
43,143,143,143,143,143,143,143,1
43,128,128,1,143,128,128,159,159
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,36,36,36,36,36,143,143,143,239,
239,5,12,239,239,143,143
25 DATA128,128,14,143,239,239,12
8,128,128,128,239,239,239,239,14
3,143,143,143,239,239,143,143,14
3,128,128,128,128,128,128,128,14
3,143,128,128,11,143,239,239,159
,159,128,128,255,255,128,128,175
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,159,128,128,255
26 DATA 255,128,128,2Ø7,2Ø7,128,
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27 DATA 143,143,175,175,143,143,
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12,143,128,128,128,128,128,128,1
43,143,128,128,143,143,239,239,2
39,239,239,239,128,128,128,128,1
28,128,128,128,143,143,128,128,2
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3Ø DATA 128,159,159,128,128,175,
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33 DATA 143,143,128,128,143,143,
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43 DATA143,143,143,143,128,128,5
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49 DATA 143,143,143,143,143,143,
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5Ø DATA 128,128,128,128,128,128,
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143,143,143,143,143,143,143
51 DATA 143,128,128,143,143,128,
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43,128,128,128,128,128,128,128,1
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3,128,128,159,159,128,128,175,17
5,128,128,255,255,128,128,128,14
Ø,143,131,159,159,128,128
53 DATA159,159,128,128,2Ø7,2Ø7,1
28,128,19,143,128,128,128,128,12
8,128,143,143,128,128,128,128,23
9,239,239,239,143,143,128,128,12
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CoCo Max

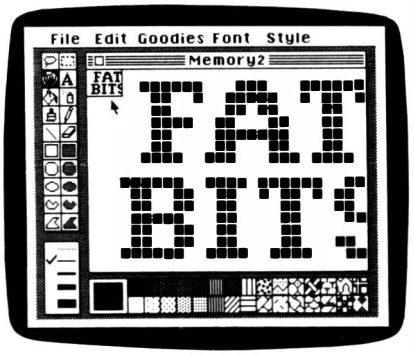
This is one of those rare programs that will captivate everyone in your family.... No one can see CoCo Max and not want to try it!

We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.

UNMATCHED CAPABILITY...

Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. It's unrivaled performance lets you create with more brilliance and more speed than any similar system – much more than you ever imagined possible. And, you can do it in black & white or color.



All the sophisticated power of the bigger systems is there: ***Icons, Pull-Down Menus,*** full ***Graphic Editing, Font Styles,*** and all kinds of handy tools and shortcuts.

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple ***Point-and-Click*** method to get any of CoCo Max's powerful graphic tools. It has them all:

You can ***Brush, Spray*** or ***Fill*** with any ***Color, Shading*** or ***Pattern.*** Use ***Rubber Band Lines*** and ***Shapes*** (square, rectangle, circle, elipse, etc.) to create perfect illustrations with speed and ease. There's a ***Pencil,*** an ***Eraser*** and even a selection of ***Caligraphy Brushes.*** And, as you can see, CoCo Max can do a lot with text. All of the newest special effects are there: ***Trace Edges, Flip, Invert, Brush Mirrors,*** etc. And all of the very latest super-capabilities like: ***Undo,*** which automatically reverses your mistakes, and ***Fat Bits*** which zooms you way in on any part of your subject to allow dot-for-dot precision.

THE BIG PICTURE

The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-½ times the area of the window itself.

FLEXIBLE PRINTING...

CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than ¼ page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to ⅛ page size.

THE COCO MAX SYSTEM

FREEDOM TO CREATE...

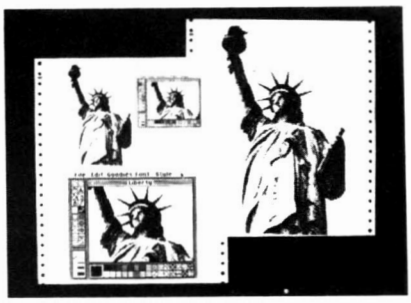
Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,

graphs, and computer art – for serious use or just for creative fun.

tion by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

Plug your same joystick, mouse or touch pad into this new input and you have a whole new kind of control. The difference is remarkable.

You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from $149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.



COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y-Branching Cable.

THE COMPLETE COCO MAX SYSTEM,
with software on ***DISK*** ***$69.95***

with software on ***CASSETTE*** (Available Mar '85) ***$69.95***

Y-BRANCHING CABLE-If you have a disk system but do not have a Multi-Slot Interface, use this economical 40-pin, 1 male, 2 female cable to connect the CoCo Max Hi-Res input unit and your disk controller to your CoCo ***$27.95***

(Sorry, not compatible with JDOS)

AN ABSOLUTE GUARANTEE

CoCo Max is a hardware/software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

THE HARDWARE...

This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen

has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen.

Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limita-

A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.

COLORWARE

Colorware Inc.
78-03G Jamaica Ave.
Woodhaven, NY 11421
(718) 647-2864

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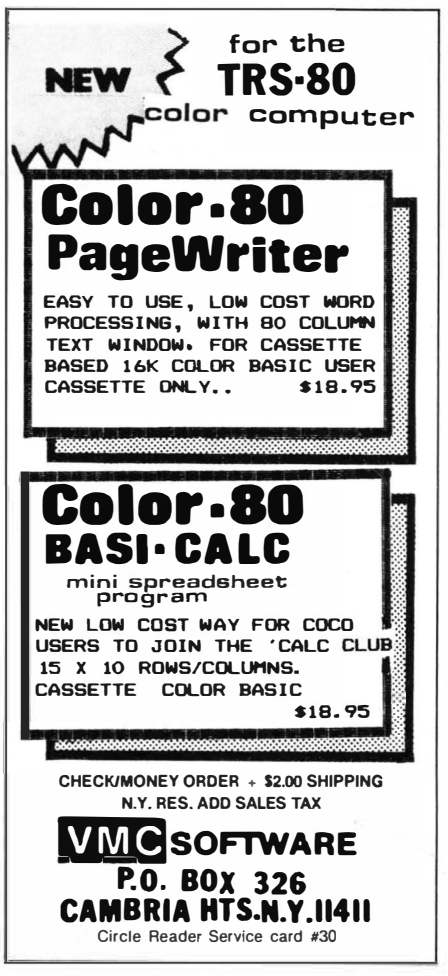
```
8,128,128,128,128,128,143,143,12
8,128,143,143,143,143,175,175,14
3,143,143,143,143,143,143,143,14
3,143,143,143,143,143
54 DATA175,175,143,143,143,143,1
28, 128,143,143,128,128,143,143,
128,128,128,128,128,128,128,128,
128,128,239,239,239,239,239,239,
128,128,128,128,239,239,143,143,
128,128,143,143,128,128,143,143,
143,143,175,175,143,143,143,143,
128,128,255,255
55 DATA128,128,159,159,128,128,2
55,255,143,143,143,143,128,128,1
43,143,128,128,12,143,128,128,12
8,128,239,239,143,143,128,128,12
8,128,128,128,128,128,128,128,12
8,128,128,128,128,128,128,128,14
3,143,128,128,22,143,128,128,255
,255,239,239,143,143
56 DATA143,143,143,143,143,143,1
59,159,143,143,143,143,128,128,1
59,159,128,128,143,143,128,128,1
2,143,128,128,128,128,128,128,12
8,128,128,128,143,143,128,128,12
8,128,128,128,143,143,128,128,12
8,128,128,128,143,143,128,128,14
3,143,143,143,5,12,128
57 DATA128,159,159,128,128,175,1
75,128,128,159,159, 128,128,175,
175,128,128,159,159,128,128,207,
207,128,128,52,143,143,143,143,1
43,128,128,128,128,128,128,143,1
43,128,128,128,128,128,128,143,1
43,128,128,128,128,128,128,143,1
43,128,128,143,143
58 DATA143,143,143,143,143,143,1
43,143,143,143,143,143, 143,143,
143,143,143,143,143,143,143,143,
143,143,143,143,143,143,128,128
60 '***************************
61 '*      HALT THIEF II      *
62 '*     CASSETTE VERSION    *
63 '*  (C) 1984 BY WADE JENSE *
64 '***************************
65 R=RND(-TIMER):POKE65547Ø,Ø:POK
E65481,Ø:POKE65482,Ø
66 CLS:PRINT"    WELCOME TO HALT
 THIEF II":GOSUB281:GOSUB273
67 DIMDE(8),DC(5),MV$(2),MO(4)
68 FORL=1TO5:READDC(L):NEXT
69 FORL=1TO8:READDE(L):NEXT
7Ø CLS:PRINT@23Ø,"HOW MANY PLAYE
RS(2-6)";:INPUTP
71 IFP>6THEN73
72 IFP<2THEN74ELSE75
73 PRINT@322,"THERE IS A LIMIT O
F 6 PLAYERS":GOTO7Ø
74 PRINT@322,"THIS GAME REQUIRES
 2 PLAYERS":GOTO7Ø
75 DIMN$(P),S(P),P$(P),AB(P)
76 DIMMN(P),CX$(15),CC$(P,3),NN(
P,8)
77 TF=P+1:DIM Z(TF),MK(1Ø),PO(1Ø
)
78 DIMXY(P)
79 FORL=1TOP:CLS
8Ø PRINT@96,"LIMIT OF 3-8 CHARAC
TERS PER NAME"
81 PRINT@164,"NAME #";L;:INPUTN$
(L)
82 AB=LEN(N$(L)):IFAB>8 OR AB<3
THEN81
83 NEXT
84 RA=RND(P):B=1:WW=1:PT=128
85 FORL=1TOP:N=B+RA
86 IF N>P THEN N=1+P-B
87 N=1+P-B
88 P$(N)=N$(B):N$(B)="":B=B+1
89 NEXT
9Ø CLS:FORL=1TOP:READDN$:N$(L)=D
N$+P$(L)+DN$
91 PRINT@35,"#";L;"PLAYER IS ";N
$(L):READS(L)
92 PRINT@485,"PRESS <C> TO CONT.
";
93 I$=INKEY$:IFI$="C"THEN94ELSE9
3
94 NEXT:CLS:PRINT@36,"EACH PLAYE
R BEGINS WITH"
95 PRINT@71,"$3ØØ AND 3 CARDS":G
OSUB247
96 FORL=1TO5ØØ:NEXT
97 CX$(1)="GO 3 EXTRA SPACES":CX
$(2)="GO 4 EXTRA SPACES"
98 CX$(3)="3 EXTRA CLUES":CX$(4)
="4 EXTRA CLUES"
99 CX$(5)="GO 5 EXTRA SPACES":CX
$(6)="5 EXTRA CLUES"
1ØØ CX$(7)="COLLECT $2ØØ FROM BA
NK":CX$(8)="COLLECT $1ØØ FROM BA
NK"
1Ø1 CX$(9)="GO 6 EXTRA SPACES":C
X$(1Ø)="6 EXTRA CLUES"
1Ø2 CX$(11)="BUY A TIP-$1ØØ":CX$
(12)="BUY A TIP-$5Ø"
1Ø3 CX$(13)="FREE TIP":CX$(14)="
TAKE ANOTHER TURN"
1Ø4 FORLL=1TOP:CLS:PRINTP$(LL):M
N(LL)=3ØØ
1Ø5 FORL=1TO3:RF=RND(CZ):CC$(LL,
L)=CX$(RF)
1Ø6 PRINT"   ("L") "CX$(RF): NEX
T:PRINT@482,"PRESS <C> TO CONT."
;
1Ø7 I$=INKEY$:IFI$="C"THEN1Ø8ELS
E1Ø7
1Ø8 NEXT:GOSUB1Ø9:GOTO116
1Ø9 RS=RND(4):Z(TF)=RS:GOSUB193
11Ø RG=RND(511):PZ=RG+(29696+(DL
*512))
111 PA=PEEK(PZ):TT=PZ
112 IF PA=255 THEN TP=PZ ELSE11Ø
113 FORL=1TO1Ø:PLAY"V31T135L2Ø4A
BGO5GBA":NEXT:POKE(3Ø183+(DL*512
)),67:POKE(3Ø184+(DL*512)),76:CL
=67:CK=82
114 FORL=1TOP:Z(L)=RS:XY(L)=(297
64+(DL*512)):NEXTL
115 CS=Ø:RETURN
116 GOSUB2Ø2:GOSUB2Ø6:GOSUB194
117 II$=INKEY$:A=Ø:GOSUB244
118 IFII$="N"THENA=1 ELSE IFII$=
"T"THENA=2
119 IFII$="E"THENA=3 ELSE IFII$=
"V"THENA=4
12Ø IFII$="S"THENA=5 ELSE IFII$=
"Z"THENA=6
121 IFII$="W"THENA=7 ELSE IFII$=
"Q"THENA=8
122 IFA>ØTHEN132
123 IFII$="U"THEN138 ELSE IFII$=
"A"THEN147
124 IFII$="D"THEN138 ELSE IFII$=
"R"GOSUB222
125 IFII$="C"THEN167 ELSE IFII$=
"F"THEN165
126 IFII$="X"THENGOTO128ELSEIFII
$="H"THEN295
127 GOTO117
128 GOSUB193:POKEXY(WW),PT
129 TL$=INKEY$:GOSUB244
13Ø IFTL$="X"THENGOSUB28ØELSE129
:GOTO131
131 GOSUB195:GOSUB2Ø3:GOTO117
132 IFMV=ØTHEN231ELSESOUND31,2
133 PH=XY(WW)+DE(A):IFPH<(29696+
(DL*512)) OR PH>(3Ø2Ø7+(DL*512))
THEN135
134 PP=PEEK(PH):FORLC=1TO5:IFPP=
DC(LC)THEN136 ELSE NEXT
135 GOSUB245:GOTO117
136 GOSUB246:MV=MV-1:POKEXY(WW),
PT:PT=PP:XY(WW)=PH
137 GOSUB2Ø3:GOTO117
138 IFMV=ØTHEN231
139 IF PT=5 THEN 141
14Ø GOSUB245:GOTO117
141 IFII$="U"ANDZ(WW)=4THEN14Ø
142 IFII$="D"ANDZ(WW)=1THEN14Ø
143 POKEXY(WW),PT
144 IFII$="U"THENZ(WW)=Z(WW)+1:X
Y(WW)=XY(WW)+512
145 IF II$="D" THEN Z(WW)=Z(WW)-
1:XY(WW)=XY(WW)-512
146 GOSUB246:MV=MV-1:GOSUB194:GO
SUB2Ø3:GOTO117
147 PLAY"O3L2T1ØV31ABABABABABABAB"
148 IFXY(WW)=TP OR (XY(WW)+1)=TP
 THEN151
149 GOSUB245:MN(WW)=MN(WW)-1ØØ:M
V=Ø
15Ø PLAY"O1V31T1C":GOTO117
151 POKEXY(WW),PT:IFZ(WW)<>Z(TF)
THEN149 ELSE FORL=1TO3:PLAY"O2T6
L3V31GP2GP2GA":NEXTL
152 RQ=RND(AZ):IFRQ=1THEN161
153 PLAY"O2V25T2AGAGAGAGAG":POKE
65478,Ø:POKE65481,Ø:POKE65482,Ø
154 CLS:PRINT@136,"CONGRATULATIO
NS"
155 PRINT@2Ø3,P$(WW):PRINT@294,"
YOU CAUGHT THE THIEF"
156 MN(WW)=MN(WW)+RZ:IFMN(WW)>=M
Z THEN159
157 FORL=1TO6ØØ:NEXTL:CS=Ø
158 GOSUB1Ø9:GOSUB2Ø2:GOSUB2Ø6:G
OTO117
159 CLS:PRINT@136,"CONGRATULATIO
NS":PRINT@2Ø3,P$(WW)
16Ø PRINT@294,"YOU WON THE GAME"
:INPUT"ANOTHER GAME [Y/N]";IN$:I
F IN$="Y"THEN RUN 65- ELSE END
161 FORL=1TO1Ø:PLAY"V3ØT45L1GO4A
CEG":NEXT
162 GOSUB192:FORLS=1TO5:GOSUB2Ø6
:NEXT
163 GOSUB194:GOSUB2Ø3:GOTO117
164 GOSUB222:GOTO117
165 FORL=(3Ø187+(DL*512))TO(3Ø2Ø
3+(DL*512)):POKEL,143:NEXTL:CS=Ø
:POKEXY(WW),PT:WW=WW+1:IFWW>P TH
EN WW=1
166 GOSUB2Ø6:GOSUB28Ø:GOSUB194:G
OSUB2Ø2:GOTO117
167 IFCS=1THEN135ELSEPOKE65478,Ø
:POKE65481,Ø:POKE65482,Ø
168 CLS:FORL=1TO3:PRINT"   ("L")
 "CC$(WW,L):NEXTL:POKEXY(WW),PT
169 CS=Ø:PRINT"TO RETURN WITHOUT
 USING CARD <5>"
17Ø INPUT"CARD #(1-3)";IY:IFIY<1
ORIY>3THEN GOSUB 195:GOSUB2Ø3:GO
TO117
171 FORLZ=1TO14:IFCC$(WW,IY)=CX$
(LZ)THEN ON LZ GOTO 177,176,182,
181,175,18Ø,184,185,174,179,186,
187,188,191
172 NEXT:GOTO17Ø
173 RF=RND(CZ):CC$(WW,IY)=CX$(RF
):GOTO117
174 ES=6:GOTO178
175 ES=5:GOTO178
176 ES=4:GOTO178
177 ES=3
```

```
178 MV=MV+ES:GOSUB195:GOSUB2Ø3:C
S=1:GOTO173
179 EC=6:GOTO183
18Ø EC=5:GOTO183
181 EC=4:GOTO183
182 EC=3
183 GOSUB193:FORLT=1TOEC:GOSUB2Ø
6:NEXT:GOSUB194:GOSUB2Ø3:CS=1:GO
TO173
184 CS=1:MN(WW)=MN(WW)+2ØØ:GOSUB
195:GOSUB2Ø3:IFMN(WW)> MZ THENGO
TO159ELSE173
185 CS=1:MN(WW)=MN(WW)+1ØØ:GOSUB
195:GOSUB2Ø3:IFMN(WW)> MZ THENGO
TO159ELSE173
186 MN(WW)=MN(WW)-5Ø
187 MN(WW)=MN(WW)-5Ø
188 GOSUB193:PQ=PEEK(TP)
189 POKETP,2Ø:FORZL=1TO4ØØ:NEXTZ
L:POKETP,PQ
19Ø CS=1:GOSUB194:GOSUB2Ø3:GOTO1
73
191 GOSUB193:GOSUB2Ø6:GOSUB194:G
OSUB2Ø2:GOTO173
192 IF Z(TF)=DL THEN RETURN
193 DL=Z(TF):GOTO196
194 IFZ(WW)=DL THENRETURN
195 DL=Z(WW)
196 '
197 ON DL GOTO 198,199,2ØØ,2Ø1
198 POKE65479,Ø:POKE65481,Ø:POKE
65482,Ø:POKE65485,Ø:POKE65487,Ø:
POKE65489,Ø:RETURN
199 POKE65478,Ø:POKE6548Ø,Ø:POKE
65483,Ø:POKE65485,Ø:POKE65487,Ø:
POKE65489,Ø:RETURN
2ØØ POKE65479,Ø:POKE6548Ø,Ø:POKE
65483,Ø:POKE65485,Ø:POKE65487,Ø:
POKE65489,Ø:RETURN
2Ø1 POKE65478,Ø:POKE65481,Ø:POKE
65483,Ø:POKE65485,Ø:POKE65487,Ø:
POKE65489,Ø:RETURN
2Ø2 MV=RND(DZ)
2Ø3 FORL=(3Ø187+(DL*512))TO(3Ø2Ø
3+(DL*512)):POKEL,143:NEXTL
2Ø4 GOSUB254:GOSUB26Ø:POKE(3Ø196
+(DL*512)),1ØØ:POKE(3Ø183+(DL*51
2)),CL:POKE(3Ø184+(DL*512)),CK
2Ø5 PT=PEEK(XY(WW)):POKEXY(WW),S
(WW):RETURN
2Ø6 GOSUB192:MK(1)=TP-64:MK(2)=T
P-6Ø:MK(3)=TP+4
2Ø7 MK(4)=TP+68:MK(5)=TP+64:MK(6
)=TP+6Ø
2Ø8 MK(7)=TP-4:MK(8)=TP-68
2Ø9 FORL=1TO8
21Ø PO(L)=PEEK(MK(L))
211 IFMK(L)=MM THEN PO(L)=128
212 NEXT
213 FORL=1TO8:XT(L)=Ø:NEXT
214 FORLL=1TO3:FORL=1TO8
215 IFPO(L)=12 OR PO(L)=5 THEN 2
33
216 IFPO(L)=DC(LL)THENXT(L)=1
217 IFPO(L)=S(WW)THENXT(L)=1
218 NEXT:NEXT
219 RA=RND(8)
22Ø IFXT(RA)=1THENTP=MK(RA)ELSE2
19
221 MM=TT:TT=TP
222 IFPO(RA)=255THEN223ELSE224
223 FORL=1TO5:PLAY"V31T135L2O4AB
GO5GBA":NEXTL:CL=67:CK=82:GOTO23
Ø
224 IFPO(RA)=159THEN225ELSE226
225 FORL=1TO2:PLAY"T55V31L2O1CDE
FGABO2CDEFGAP1P1P1":NEXTL:CL=83:
CK=8Ø:GOTO23Ø
226 IFPO(RA)=175THEN227ELSE228
227 PLAY"V9":FORL=1TO2Ø:PLAY"V+O
1T1ØØL1D-":NEXTL:CL=68:CK=82:GOT
O23Ø
228 IFPO(RA)=5ORPO(RA)=12THEN229
ELSE222
229 PLAY"V24T2ØL2CDEFGAB":CL=69:
CK=76
23Ø POKE(3Ø183+(DL*512)),CL:POKE
(3Ø184+(DL*512)),CK:RETURN
231 GOSUB245:FORLL=1TO1Ø:POKE(3Ø
2Ø2+(DL*512)),112:POKE(3Ø2Ø3+(DL
*512)),112:FORL=1TO1Ø
232 NEXTL:POKE(3Ø2Ø2+(DL*512)),9
6:POKE(3Ø2Ø3+(DL*512)),96:NEXTLL
:GOTO117
233 IFMK(L)=MM THEN 216
234 MM=TT:TT=TP
235 RL=RND(3):IFRL=1ORRL=2THEN21
6ELSETP=MK(L)
236 PLAY"V24T2ØL2CDEFGAB":POKE(3
Ø183+(DL*512)),69:POKE(3Ø184+(DL
*512)),76:CL=69:CK=76:PO(RA)=5
237 IFZ(TF)=4THEN239 ELSE IFZ(TF
)=1THEN24Ø
238 RC=RND(4):IFRC<=2THEN239 ELS
E 24Ø
239 Z(TF)=Z(TF)-1:TP=TP-512:FORL
=1TO999:NEXTL:GOSUB192:RETURN
24Ø Z(TF)=Z(TF)+1:TP=TP+512:FORL
=1TO999:NEXTL:GOSUB192:RETURN
241 DATA255,159,175,128,5
242 DATA-32,-3Ø,2,34,32,3Ø,-2,-3
4
243 DATA@,Ø,^,3Ø,_,31,#,35,$,37,
&,38
244 POKE(3Ø177+(DL*512)),96:POKE
(3Ø178+(DL*512)),127:RETURN
245 POKE(3Ø18Ø+(DL*512)),78:POKE
(3Ø181+(DL*512)),79:RETURN
246 POKE(3Ø18Ø+(DL*512)),79:POKE
(3Ø181+(DL*512)),75:RETURN
247 FOR LL=1TOP
248 AB(LL)=LEN(P$(LL))
249 FOR L=AB(LL)TO1 STEP-1
25Ø NM$=RIGHT$(P$(LL),L)
251 NN(LL,L)=ASC(NM$)
252 NEXT:NEXT
253 RETURN
254 NL=3Ø194
255 FOR L=1TOAB(WW)
256 POKE(NL+(DL*512)),NN(WW,L)
257 NL=NL-1
258 NEXT
259 RETURN
26Ø MV$=STR$(MV):NL=3Ø2Ø2
261 FOR L=2TO1 STEP-1
262 NM$=RIGHT$(MV$,L)
263 MV(L)=ASC(NM$)
264 POKE(NL+(DL*512)),(MV(L)+64)
265 NL=NL+1:NEXT
266 MN$=STR$(MN(WW)):NL=3Ø197
267 FOR L=4TO1 STEP-1
268 NM$=RIGHT$(MN$,L)
269 MO(L)=ASC(NM$)
27Ø POKE(NL+(DL*512)),(MO(L)+64)
271 NL=NL+1:NEXT
272 RETURN
273 CLS:PRINT@224,"DIFFACULTY (1
-4) 1=EASY, 4=HARD";:INPUTDA
274 IF DA>4 OR DA<1 THEN 273 ELS
E DB=INT(DA)
275 ON DB GOTO 276,277,278,279
276 CZ=14:AZ=5:DZ=12:MZ=2ØØØ:RZ=
8ØØ:RETURN
277 CZ=12:AZ=4:DZ=1Ø:MZ=25ØØ:RZ=
7ØØ:RETURN
278 CZ=1Ø:AZ=3:DZ=8:MZ=3ØØØ:RZ=6
ØØ:RETURN
279 CZ=6:AZ=2:DZ=6:MZ=35ØØ:RZ=5Ø
Ø:RETURN
28Ø FORL=(3Ø187+(DL*512))TO(3Ø2Ø
3+(DL*512)):POKEL,143:NEXTL:RETU
RN
281 PRINT:PRINT"          --HELP
TABLE--"
282 PRINT"N-NORTH":PRINT"T-NORTH
EAST"
283 PRINT"E-EAST":PRINT"V-SOUTHE
AST"
284 PRINT"S-SOUTH":PRINT"Z-SOUTH
WEST"
285 PRINT"W-WEST":PRINT"Q-NORTHW
EST"
286 PRINT"U-UP":PRINT"D-DOWN"
287 PRINT:PRINT"   PRESS ANY KEY
 TO CONTINUE"
288 I$=INKEY$:IFI$=""THEN288
289 CLS:PRINT"        --HELP TABL
E CONT.--":PRINT
29Ø PRINT"A-ARREST":PRINT"R-REPE
AT CLUE"
291 PRINT"C-USE CARD":PRINT"X-DI
SPLAY THIEF'S LEVEL"
292 PRINT"X-RETURN TO YOUR LEVEL
":PRINT"F-FINISH TURN"
293 PRINT"H-HELP TABLE":PRINT:PR
INT"   PRESS ANY KEY TO CONTINUE
"
294 I$=INKEY$:IFI$=""THEN294ELSE
RETURN
295 POKEXY(WW),PT:GOSUB281:GOSUB
195:GOSUB2Ø3:GOTO173
```

END



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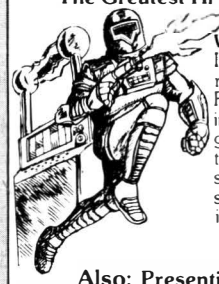

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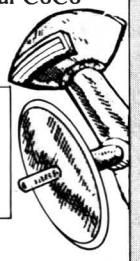

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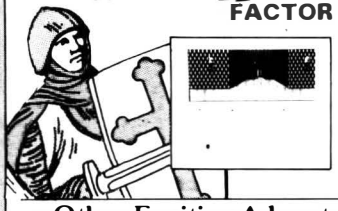

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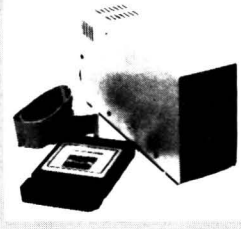

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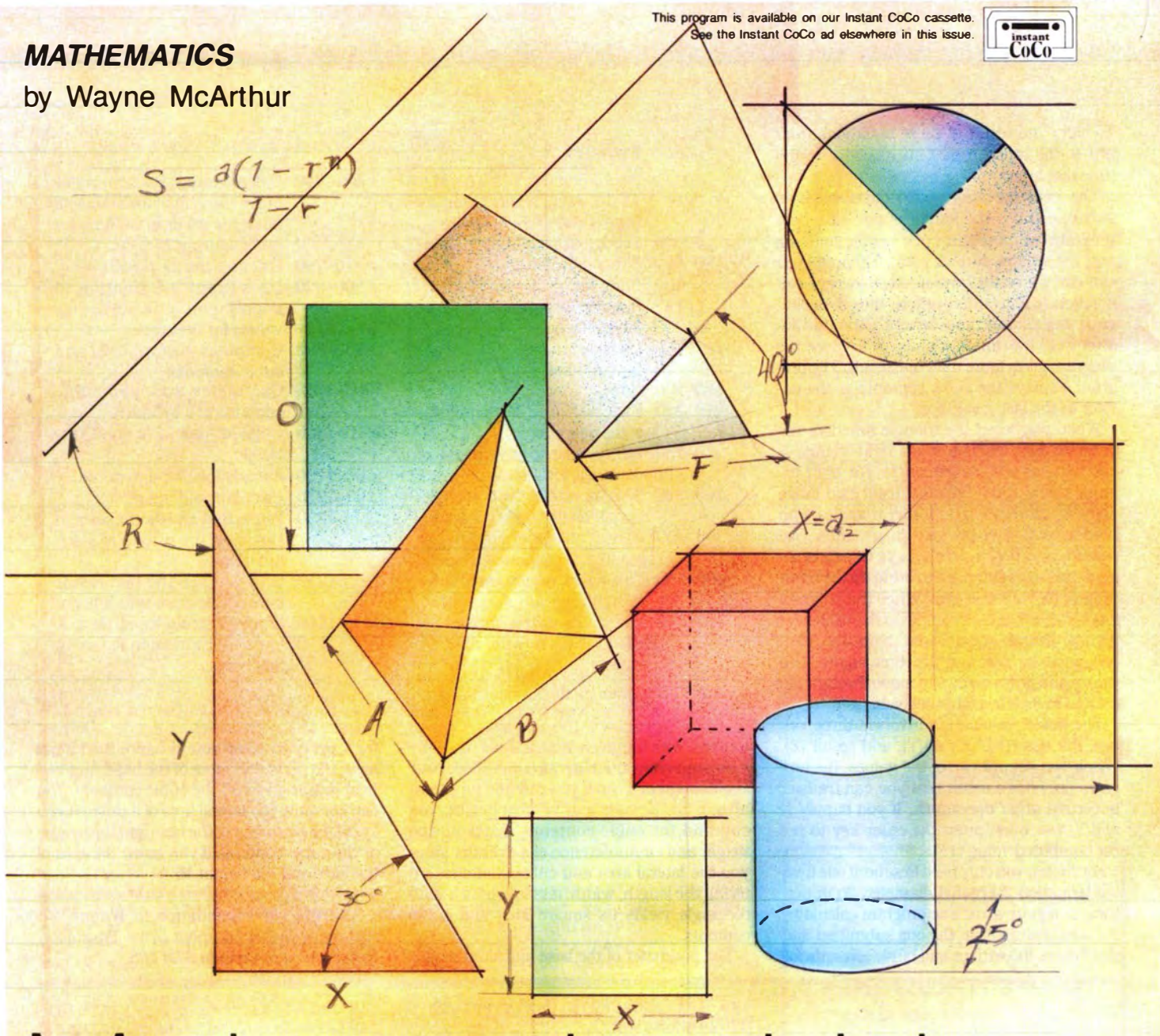
MATHEMATICS

by Wayne McArthur



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Using the Program

In the opening screen, a blinking cursor marks the instructions. The first operation, addition, is highlighted in the line below, and another highlighted box at the bottom of the screen contains the result of the last operation—zero when you first run the program. Use the right- and left-arrow keys to move through the list of operations until the one you want appears in the top highlighted box; then press the enter key to bring up the screen for that operation.

The first five operations are addition, subtraction, multiplication, division, and square root. The program prompts you to input the values (only one value is required to compute a square root) and then displays the answer.

System Requirements

16K RAM
Extended Color Basic

Illustration by Bob Dukette

To carry the result of these equations from one to the other, type Y in response to the save-result prompt.

The next operation, solid cube, requires only one entry: the length of one side. The program computes the cube's cubic contents and the square surface area. Although you can carry a result from a single-answer calculation (e.g., multiplication) into the solid-cube calculation, you cannot carry an answer from it to another problem because the program gives more than one result. The program displays the cubic contents as the answer in the last-result box.

When you select the triangle function, the program asks whether it is a right triangle—one that has a 90-degree angle. For right triangles, you must enter at least two more items of information; for other triangles, you need at least three pieces of information. Use the up- and down-arrow keys to select an item; press the enter key to bring up the input prompt for your selection. When the program has sufficient data, it computes the values for vertical height, square area, base, hypotenuse, opposite side, and the three angles. Use the up and down arrows to move through the list and reveal the computed values.

The power calculation involves three values: the base (X), power (Y), and result (Z). When you submit two of the values, the program provides a result that you can transfer to certain other operations. If you supply X and Y, you must press the enter key to see the computed value of Z.

For circles, you only need to submit one item of information: the radius, diameter, circumference, or square area. The program calculates the other values from the one submitted and also figures the surface and cubic contents for a sphere with the given dimensions.

By supplying the base circumference and slant height of a cone, you can find its lateral area; with the base and vertical height, you can find the cubic contents. Entering the height and circumference of a cylinder gives you the lateral area and cubic contents; entering the length, width, and height of a solid rectangle yields its square area and cubic contents.

The perimeter of the base and slant height for a pyramid allow you to figure the lateral area; the perimeter, area of the base, and vertical height give you the cubic contents. You can compute the lateral area of a prism if you know the perimeter of the base and the height, or the cubic contents if you know the area of the base and the height. ■

Line	Function
10–40	Reads function titles A$(1) to A$(14) into memory and assigns value of PI.
50–80	Sets up the menu page.
90–120	Function Choices
130	Addition
140	Subtraction
150	Multiplication
160	Division
170	Square Root
180–200	Cube
210–230	Enters X and Y values for some operations.
240–250	Allows user to save result or dispense with it.
260–330	Sets up screen for a triangle; asks if angle C is 90 degrees.
340–390	Allows choice of entering or reading data about a triangle.
400–550	Calculates values entered for right triangles.
560–660	Calculates values entered for triangles that are not right triangles.
670–700	Calculates angles from previously entered information and changes them to radians for other figuring.
710–790	Calculations for powers
800–920	Uses input information to supply you with unknown values for the circle.
930–990	Computes surface area and cubic contents.
1000–1040	Calculates area and cubic contents of a cylinder.
1050–1080	Calculations for a solid rectangle
1090–1150	Calculations for a pyramid
1160–1210	Calculations for a prism
1220	Pause that allows the user to look over the results of some functions.
1230	Lets you see the last result from single-answer functions.
1240	Changes string input ($) to a numeric expression for some functions.

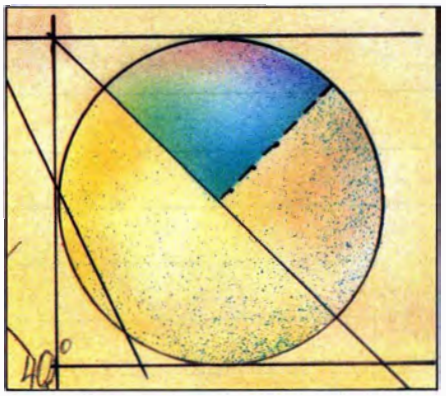
Table 1. Program Flow

Address correspondence to Wayne McArthur, 1105-204 Fairmont Drive, Saskatoon, Saskatchewan, Canada S7M 4P5.

Program Listing. Mathematic Helper

```
10 DIMA$(14):FORA=1TO14:READA$(A
):NEXT:B$=CHR$(128):A=1
20 PI=3.14159265
30 DATAADDITION,SUBTRACTION,MULT
IPLICATION,DIVISION,SQUARE ROOT,
SOLID CUBE
40 DATATRIANGLE,POWER,CIRCLES,CO
NE,CYLINDER,SOLID RECTANGLE,PYRA
MID,PRISM
50 CLS0:PRINT@7,"mathematic"B$"h
elper";
60 PRINT@65,"use"B$"arrows"B$"fo
r"B$"function"B$"choice";
70 GOSUB123Ø
80 PRINT@196,"then"B$"enter";:PR
INT@128,A$(A)
90 Z$=INKEY$:IFZ$=""THENFORF=134
TO137STEP3:PRINT@64,CHR$(F);:PLA
Y"P50":NEXT:GOTO90
100 IFZ$=CHR$(08)THENA=A-1ELSEIF
Z$=CHR$(09)THENA=A+1
110 IFA>14THENA=1ELSEIFA<1THENA=
14
120 IFZ$=CHR$(13)THEN130ELSEPRIN
T@128,A$(A):GOTO90
130 IFA=1GOSUB210:Q=X+Y:PRINTQ:G
OTO240ELSE140
140 IFA=2GOSUB210:Q=X-Y:PRINTQ:G
OTO240ELSE150
150 IFA=3GOSUB210:Q=X*Y:PRINTQ:G
OTO240ELSE160
160 IFA=4GOSUB210:IFY=0THEN50ELS
EQ=X/Y:PRINTQ:GOTO240ELSE170
170 IFA=5THENS=1:GOSUB210:Q=SQR(
X):PRINTQ:GOTO240ELSE180
180 IFA><6THEN260ELSES=1:GOSUB21
0
190 PRINT@288,"cubic"B$"contents
";:Q=X^3:PRINTQ
200 PRINT"sq"B$"surface"B$"area"
(X*X)*6:GOTO120
210 PRINT@224,"enter":IFX><0THEN
PRINT"x?"X:GOTO230
220 INPUT"x";X$:X=VAL(X$)
230 IFS=1THENS=0:PRINT@320," =";
:RETURN ELSEINPUT"y";Y$:Y=VAL(Y$
):PRINT@320," =";:RETURN
240 PRINT@352,"save"B$"result y-
n ";:Z$=INKEY$:IFZ$="Y"THENX=Q E
LSEIFZ$="N"THENX=0ELSE240
250 GOTO50
260 IFA>7THEN710ELSEZ=0:CLS0:D=3
3
270 F$(0)="vertical"+B$+"height"
:F$(1)="square"+B$+"area":F$(2)=
"base":F$(3)="hypotenuse":F$(4)=
"opposite":F$(5)="angle"+B$+"a":
F$(6)="angle"+B$+"b":F$(7)="angl
e"+B$+"c"
280 PRINT@93,"b";:FORQ=125TO381S
TEP32:PRINT@Q,"O";:NEXT:PRINT@41
3,"c";:FORQ=412TO404STEP-1:PRINT
@Q,"B";:NEXT
290 FORQ=124TO373STEP31:PRINT@Q,
"H";:NEXT:PRINT@403,"a";
300 PRINT@418,"ANGLE c = 90 DEGR
EES? <Y><N>";:PRINT@418,STRING$(
30,B$);:R$=INKEY$:IFR$=""THEN300
310 PRINT@0,"use"B$"arrows"B$"to
"B$"move"B$"up"B$"or"B$"down";
320 PRINT@480,"PRESS"B$"enter"B$
"<OR>"B$"n"B$"FOR"B$"NEW"B$"SET"
;
330 FORS=0TO7:D=D+32:PRINT@D-1,F
$(S),:NEXT:D=65:IFR$="Y"ORR$="N"
THEN340ELSED=33:GOTO300
340 Z$=INKEY$:IFZ$=""THEN340ELSE
PRINT@D-1,F$(Z),
350 IFZ$=CHR$(13)THENPRINT@416,F
$(Z),:INPUTIN$:IN=VAL(IN$):PRINT
@416,STRING$(32,B$);:GOSUB400
360 IFZ$="N"THENFORZ=0TO7:A(Z)=0
:NEXT:A=7:GOTO50
370 IFZ$=CHR$(94)ANDZ>=1THEND=D-
32:Z=Z-1
380 IFZ$=CHR$(10)ANDZ<=6THEND=D+
32:Z=Z+1
390 PRINT@D-1,">";A(Z),:GOTO340
400 A(Z)=IN:IFR$="Y"THENA(7)=90E
LSE560
410 IFA(5)>=90ORA(6)>=90THENA(Z)
```

```
=Ø
42Ø IFA(Ø)>ØTHENA(4)=A(Ø)ELSEA(Ø
)=A(4)
43Ø IFA(2)>ØTHENIFA(Ø)=A(2)THENA
(5)=45:A(6)=45
44Ø IFA(Ø)>ØANDA(2)>ØTHENA(1)=(A
(2)*A(Ø))/2:A(3)=SQR((A(2)*A(2))
+(A(Ø)*A(Ø))):AA=A(Ø)/A(2):A(5)=
ATN(AA)*57.29577951
45Ø GOSUB68Ø:IFA(Ø)>ØANDA(1)>ØTH
ENA(2)=(2*A(1))/A(Ø)
46Ø IFA(1)>ØANDA(2)>ØTHENA(Ø)=(2
*A(1))/A(2)
47Ø IFA(3)>ØANDA(6)>ØTHENA(4)=A(
3)*COS(B)
48Ø IFA(3)>ØANDA(5)>ØTHENA(4)=A(
3)*SIN(A)
49Ø IFA(Ø)>ØANDA(5)>ØTHENA(3)=A(
Ø)/SIN(A)
5ØØ IFA(2)>ØANDA(5)>ØTHENA(3)=A(
2)/COS(A)
51Ø IFA(2)>ØANDA(3)>ØTHENA(Ø)=SQ
R((A(3)*A(3))-(A(2)*A(2)))
52Ø IFA(Ø)>ØANDA(3)>ØTHENA(2)=SQ
R((A(3)*A(3))-(A(Ø)*A(Ø)))
53Ø IFA(6)>ØANDA(Ø)>ØTHENA(3)=A(
Ø)/COS(B)
54Ø IFA(5)=45THENA(Ø)=SQR(A(1)+A
(1))
55Ø T=T+1:IFT<4THENGOTO42ØELSET=
Ø:RETURN
56Ø GOSUB67Ø
57Ø IFA(2)>ØANDA(3)>ØANDA(5)>ØTH
ENA(4)=SQR((A(2)*A(2)+A(3)*A(3))
-2*(A(2)*A(3)*COS(A)))
58Ø IFA(4)>ØANDA(3)>ØANDA(6)>ØTH
ENA(2)=SQR((A(4)*A(4)+A(3)*A(3))
-2*(A(4)*A(3)*COS(B)))
59Ø IFA(4)>ØANDA(2)>ØANDA(7)>ØTH
ENA(3)=SQR((A(4)*A(4)+A(2)*A(2))
-2*(A(4)*A(2)*COS(C)))
6ØØ IFA(4)>ØANDA(6)>ØANDA(5)>ØTH
ENA(2)=(A(4)*SIN(B))/SIN(A)
61Ø IFA(4)>ØANDA(7)>ØANDA(5)>ØTH
ENA(3)=(A(4)*SIN(C))/SIN(A)
62Ø IFA(5)>ØANDA(6)>ØANDA(3)>ØTH
ENA(4)=(A(3)*SIN(A))/SIN(C):A(2)
=(A(3)*SIN(B))/SIN(C)
63Ø IFA(4)>ØANDA(2)>ØANDA(7)>ØTH
ENP=.5*(18Ø-A(7)):P=P/57.2957795
1:P=TAN(P):N=((A(4)-A(2))/(A(4)+
A(2)))*P:N=ATN(N):P=ATN(P):P=P*5
7.29577951:N=N*57.29577951:A(5)=
P+N:A(6)=P-N
64Ø IFA(2)>ØANDA(3)>ØANDA(4)>ØTH
ENAA=(((A(2)*A(2))+(A(3)*A(3)))-
(A(4)*A(4)))/(2*(A(2)*A(3))):SB=
A(3)*AA:SA=SQR((A(3)*A(3))-(SB*S
B)):A(5)=SA/SB:A(5)=ATN(A(5))*57
.29577951
65Ø IFA(2)>ØANDSB>ØANDSA>ØANDA(7
)=ØTHENSB=A(2)-SB:A(7)=SA/SB:A(7
)=ATN(A(7))*57.29577951
66Ø IFA(2)>ØANDSA>ØTHENA(Ø)=SA:A
(1)=(A(2)*A(Ø))/2
67Ø IFA(5)>ØANDA(6)>ØTHENA(7)=18
Ø-(A(5)+A(6))
68Ø IFA(6)>ØANDA(7)>ØTHENA(5)=18
Ø-(A(6)+A(7))
69Ø IFA(5)>ØANDA(7)>ØTHENA(6)=18
Ø-(A(5)+A(7))
7ØØ A=A(5)/57.29577951:B=A(6)/57
.29577951:C=A(7)/57.29577951:RET
URN
71Ø IFA>8THEN8ØØELSECLSØ:PRINT@1
ØØ,"x=BASE y=POWER z=RESULT";
72Ø PRINT@16Ø,"if"B$"value"B$"un
known"B$"press"B$"<ENTER>"B$B$;:
GOSUB123Ø:GOSUB21Ø:PRINT@32Ø,"z"
;:INPUTZ$:Z=VAL(Z$)
```



```
73Ø IFX>ØANDY>ØTHENZ=X^Y:Q=Z:GOT
O79Ø
74Ø IFX>ØANDZ>ØTHENY=LOG(Z)/LOG(
X):Q=Y:GOTO79Ø
75Ø IFY<1ØTHENT=1ØØØELSET=1Ø
76Ø PRINT"PRESS KEY WHEN CALCULA
TION ENDS!";
77Ø Q=X^Y:IFQ<Z THENX=X+T ELSEIF
Q>Z THENX=X-(T):T=T*.1
78Ø PRINT@258,X,:S$=INKEY$:IFS$=
""THEN77ØELSEQ=X
79Ø PRINT@256,"x"X:PRINT"y"Y:PRI
NT"z"Z:PRINT:GOTO24Ø
8ØØ IFA>9THEN93ØELSECLSØ:PRINT@4
3,"circles";
81Ø PRINT@97,"press"B$"enter"B$"
if"B$"value"B$"unknown";
82Ø PRINT@16Ø,;
83Ø INPUT"radius";X$:GOSUB124Ø:I
FX>ØTHEN89Ø
84Ø INPUT"diameter";Y$:GOSUB 124
Ø
85Ø IFY>ØTHENX=Y/2:GOTO89Ø
86Ø INPUT"circumference";Z$:GOSU
B124Ø
87Ø IFZ>ØTHENX=Z/(2*PI):GOTO89Ø
88Ø INPUT"area";SA$:SA=VAL(SA$):
IFSA>ØTHENX=SQR(SA/PI)
89Ø Y=2*X:Z=PI*Y:SA=PI*(X*X)
9ØØ PRINT@16Ø,"radius"X:PRINT"di
ameter"Y:PRINT"circumference"Z:P
RINT"square"B$"area"SA
91Ø PRINT"sphere"B$"surface"B$"a
rea":PRINTX*X*(4*PI)
92Ø PRINT"sphere"B$"cubical"B$"c
ontents":PRINTX^3*((4*PI)/3):GOT
O122Ø
93Ø IFA>1ØTHEN1ØØØELSECLSØ
94Ø PRINT@44,"cones";
95Ø PRINT@96,"base"B$"circumfere
nce":INPUTX$
96Ø PRINT"slant"B$"height":INPUT
Y$
97Ø PRINT"vertical"B$"height":IN
PUTZ$:GOSUB124Ø
98Ø PRINT"lateral"B$"area"(Y*X)/
2:PRINT
99Ø PRINT"cubical"B$"contents";:
RA=X/(2*PI):AR=PI*(RA*RA):PRINT(
AR*Z)/3:GOTO122Ø
1ØØØ IFA>11THEN1Ø5ØELSECLSØ:PRIN
T@42,"cylinders";
1Ø1Ø PRINT@128,"height";:INPUTX$
1Ø2Ø PRINT:INPUT"circumference";
Y$:GOSUB124Ø
1Ø3Ø PRINT:PRINT"lateral"B$"area
"X*Y
1Ø4Ø PRINT:PRINT"cubical"B$"cont
ents";:RA=Y/(2*PI):AR=PI*(RA*RA)
:PRINTAR*X:GOTO122Ø
1Ø5Ø IFA>12THEN1Ø9ØELSECLSØ:PRIN
T@43,"rectangles";
1Ø6Ø PRINT@128,;:INPUT"length";X
$:INPUT"width";Y$:INPUT"height";
Z$:GOSUB124Ø
1Ø7Ø PRINT"square"B$"area"2*((X*
Z)+(Y*Z)+(X*Y))
1Ø8Ø PRINT"cubical"B$"contents"X
*Y*Z:GOTO122Ø
1Ø9Ø IFA>13THEN116ØELSECLSØ:PRIN
T@44,"pyramids";
11ØØ PRINT@128,"perimeter"B$"of"
B$"base";:INPUTX$
111Ø PRINT"slant"B$"height";:INP
UTY$
112Ø PRINT"area"B$"of"B$"base";:
INPUTZ$:GOSUB124Ø
113Ø PRINT"vertical"B$"height";:
INPUTVH$:VH=VAL(VH$)
114Ø PRINT"lateral"B$"area"(X*Y)
/2
115Ø PRINT"cubical"B$"contents"(
Z*VH)/3:GOTO122Ø
116Ø CLSØ:PRINT@44,"prisms";
117Ø PRINT@192,"perimeter"B$"of"
B$"base";:INPUTX$
118Ø PRINT"area"B$"of"B$"base";:
INPUTY$
119Ø INPUT"height";Z$:GOSUB124Ø
12ØØ PRINT"lateral"B$"area"X*Z
121Ø PRINT"cubical"B$"contents"Y
*Z
122Ø PRINT@416,"press"B$"enter"B
$"to"B$"continue";:INPUTX$:X=VAL
(X$):GOTO5Ø
123Ø PRINT@448,"last"B$"result"B
$"was";:PRINT@48Ø,Q,:RETURN
124Ø X=VAL(X$):Y=VAL(Y$):Z=VAL(Z
$):RETURN                    END
```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This program is available on our Instant CoCo cassette.
See the Instant CoCo ad elsewhere in this issue.

by Delbert A. Baker

Finding Firewood Best-Buys

Calculate the most economical way to fill your woodshed.

Photo by Mark Cotliss

One day in October 1982, a friend asked if I'd like to buy pine firewood at $60 per cord, cut and delivered. I bought two cords and split and stacked it. But as I burned it to keep warm that winter I kept wondering if I had made a good deal.

I reasoned that my CoCo should be able to do the calculations and store the necessary data with ease. However, before I could write equations for the program, I had to decide what kind of comparison would help me make a quick decision about which firewood to purchase. I wanted to be able to look through the classifieds and compare the woods offered to oak, which was selling for $70 to $75 (cut and delivered), and determine whether they were a good value in heat content per dollar.

How the Program Works

I wrote an equation that would make the comparison and return an answer in cost per cord as if I had spent the same amount of money on oak. For example, if I were offered wood with half the heat content of oak, the program would tell me that the equivalent price for a cord of oak was twice the price of the wood in question. I could then check the newspaper to find out the prevailing cost for a cord of oak. If the price of oak were higher than the calculated price of the other wood, then the other wood would be a good deal, comparatively. If it were lower, it wouldn't be such a bargain.

Research at the local library yielded the total heat value per cord of several kinds of wood and the heat value of several nonwood fuels. (See Table 1 for a short bibliography on wood heat.) I used this information to produce a program with five options:

1 Calculation
2 Available Wood Data
3 Explanation
4 Nonwood Conversion
5 Quit

Option 1 performs the calculation that allows you to compare the price of a certain wood to the prevailing cost of oak. Option 2 displays the heat content (in millions of BTUs per cord) of all the types of wood for which I could find data. You must type in the name of the wood exactly as it appears in the DATA statements; otherwise you receive a message that reads, "I do not have that wood data." Option 3 explains the meaning of the calculation in option 1.

Option 4 displays the nonwood-fuel data and prompts you to select one of the items. It then asks you which wood you wish to compare. The result given is the amount of the nonwood source that replaces one cord of the chosen wood if both are burned at 100-percent efficiency.

To make true comparisons, you need the efficiency ratings of the respective heating units—e.g., a wood stove and an oil furnace. If the stove is 50-percent efficient and the furnace is 75-percent efficient, multiply the wood amount by .5 and the nonwood amount by .75 to find out how much heat is delivered. Compare the prices to decide which fuel is most economical. You could also use this option to compare operating costs before installing a heating system.

A word of caution: The program evaluates natural products that are highly variable in their properties. Consequently, the calculated results are approximate. Furthermore, the program does not take all factors into account; you must decide what value to attach to such things as delivery, splitting, and stacking.

System Requirements

16K RAM
Extended Color Basic

Program Structure

Lines 100–620 contain the main program,

continued

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Pick of the Month

The first question on our Reader Service card adjacent to this page asks you to pick your favorite article or feature in this issue. Write the appropriate letter from the list below in the space provided on the card.

A. *Doctor ASCII*, Esposito and Ramhoff, p. 12

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Coming Next Month

Believe it or not, the Christmas buying season is almost upon us. Do you know what to get for your CoCo-using friends and relatives? HOT CoCo's December issue provides the shopping advice you need. Richard Esposito, author of our popular Doctor ASCII column, gives you his best bets for Christmas gifts. And our editors have thought long and hard about what they would like to see under the tree. Read about their picks next month.

OS-9: That's a word you've seen a lot lately. OS-9 is Tandy's disk operating system (DOS) of the future for the CoCo. Next month, OS-9 expert Brian Lantz answers some of the most-often asked questions about this up-and-coming DOS.

Ever left your CoCo or disk drive on all night, or longer, without realizing it? Mark Haverstock shows you how to install power-indicator LEDs on both these items in December. The same article tells you how to move the on/off and reset buttons from the rear to the front of the CoCo.

We have much more for December. So pick up a copy of *HOT CoCo* next month and enjoy!■

including the menu, subroutine directions, and the wood data. Lines 630–890 control option 1. Line 640 prompts for a wood type; lines 660–690 search for a data match. If a match is not found, control passes to lines 910–960. The data is restored, the no-match message is displayed, and the program asks you if you want to see all the wood types available. If you elect to see the data, control passes to the subroutine in option 2. If a match is found during the search, the program jumps to lines 710–890, where you input an asking price and confirm it. The calculation is performed in lines 760–780; the results are reported by lines 840–870.

Lines 980–1130 are the data-display routine. The program displays the data in screens of 12 lines until it reaches STOP, 0000. You then return to the main menu. Lines 1150–1420 contain a short explanation of the result of the calculation in option 1. Delete this section if you wish to conserve memory.

Lines 1440–1990 control option 4. Lines 1440–1460 set the data pointer to the first entry of the nonwood data. Line 1470 reads the nonwood data and stores it in an array. Lines 1490–1590 display the nonwood data, ask you to enter the wood type that you want, and check your input. When you confirm your selection, control passes to lines 1600–1640. After you submit the wood type, the wood data is retrieved from the DATA lines. Line 1650 makes the comparison calculation and adjusts the result to read in whole numbers for nonwood materials measured in tons. Line 1660 adjusts the calculation result to two decimal places for nonwood materials measured in tons. Lines 1670–1740 display the results of the calculation. Lines 1810–1940 provide a short explanation of option 4. Lines 1960–1990 offer the option 2 data display if an invalid wood type is entered in line 1600.

Modifying the Program

If oak is not a common firewood in your area, you might want to choose another standard for comparison. Select a wood that is widely enough used that the price does not vary between suppliers.

If, for example, you live in an area where maple is the standard and you know (or find out) that it is all from one of the hard species like sugar maple, list lines 470–570 to find the data entry for hard maple. Substitute the basic heat value for hard maple (24,000) in the equation, X = 25,000, in line 760. Edit line 820, deleting "oak" and replacing it with "hard maple." The program will then use maple as the standard for comparison. You might also want to change the explanatory subroutine (option 3) to reflect your modification.

You can add another kind of wood or nonwood fuel to option 2. To add a wood source, you must know the total heat value of a cord of that wood in thousands of BTUs. (If the value is given in millions of BTUs, move the decimal point three places to right: 26.5 million BTUs equal 26,500 thousand BTUs.) Insert your data pair—wood,BTUs—in the DATA statements anywhere before the stop. If you insert it after this marker, your data will be treated as nonwood data.

The nonwood data is organized in sets of three. The first item is the fuel source, the second is the heat value in thousands of BTUs per chosen unit, and the third is the unit used to figure the total heat value. For example, kerosene has a total heat value of 135,000 BTUs per gallon, so the data for kerosene would read, "KEROSENE,135,gallon". You can place nonwood data anywhere between the stop entry for wood and the stop entry for nonwood (XXXX,00,XX). Keep in mind that placement of the new data determines where it will be displayed by line 1510. In addition, you have to allow for increases in the number of nonwood sources in lines 310, 1470, 1500, and 1520–1550.

As written, the program uses about 6,600 bytes. To run the program in Color Basic, change the LINE INPUT statement in line 640 to an INPUT statement. Be careful when typing in the program and answering the prompts—I have included only minimal error checking. If you have problems with the program, please write to me, enclosing a self-addressed, stamped envelope for my reply. ■

Barr, E.M., *The How-To Book for Woodcutters*. EMBAR Endeavors, Entre Nous Inc., 1980.

The Family Handyman magazine (ed.). *Heating with Wood*, Butterick Pub., 1978.

Vivian, John, *Wood Heat*, Rodale Press, 1976.

Table 1. Bibliography

Address correspondence to Delbert A. Baker, 4780 Christopher Ave., Albany, OR 97321.

Program Listing. Firewood

```
11Ø REM  FIREWOOD COST PROGRAM
12Ø REM  D. BAKER  1983
13Ø REM   TRS-8Ø COLOR COMPUTER
14Ø REM
15Ø REM  Q,Q$=USER RESPONSES
16Ø REM  W$=INPUT, WOOD TYPE
17Ø REM  P=INPUT, WOOD PRICE
18Ø REM  N$=DATA, WOOD TYPE
19Ø REM  H=DATA, HEAT VALUE
2ØØ REM  X=HEAT VALUE OF OAK
21Ø REM  C=CALCULATED WOOD COST
22Ø REM  E=HEAT IN KILOWATT HOUR
S
23Ø REM  G=HEAT IN CUBIC FEET OF
          NATURAL GAS
24Ø REM  A$(L)=DATA, NON-WOOD SO
URCE
25Ø REM  R(L)=DATA,NON-WOOD SOUR
CE
26Ø REM  U$(L)=DATA, NON-WOOD SO
URCE
27Ø REM  V=CALCULATED NON-WOOD Q
UANTITY
28Ø REM  Y=FOR-NEXT VARIABLE
29Ø REM
3ØØ P=Ø: H=Ø: C=Ø: E=Ø: G=Ø
31Ø DIMA$(12),R(12),U$(12)
32Ø CLS
33Ø PRINT TAB(13) "MENU": PRINT
34Ø PRINT "1   CALCULATION": PRI
NT
35Ø PRINT "2   AVAILABLE WOOD DA
TA":PRINT
36Ø PRINT "3   EXPLANATION":PRIN
T
37Ø PRINT "4   NON-WOOD CONVERSI
ON":PRINT
38Ø PRINT "5   QUIT":PRINT
39Ø INPUT "WHICH DO YOU WANT";Q
4ØØ IF Q<1 OR Q>5 GOTO 32Ø
41Ø IF Q=5 THEN 46Ø ELSE 42Ø
42Ø ON Q GOSUB 63Ø,98Ø,115Ø, 144
Ø
43Ø PRINT "ENTER <M> FOR THE MEN
U"
44Ø INPUT "PRESS <ENTER> IF FINI
SHED";Q$
45Ø IF Q$="M" THEN 32Ø
46Ø PRINT "GOODBYE FOR NOW"
47Ø DATA APPLE, 265ØØ, BLACK ASH
,191ØØ, WHITE ASH, 236ØØ
48Ø DATA ASPEN, 147ØØ, BASSWOOD,
135ØØ, BEECH, 24ØØØ
49Ø DATA PAPER BIRCH, 2Ø3ØØ, YEL
LOW BIRCH, 236ØØ, BOXELDER, 179Ø
Ø
5ØØ DATA CEDAR, 122ØØ, CHERRY, 2
ØØØØ, COTTONWOOD, 135ØØ
51Ø DATA ELM, 195ØØ, FIR, 143ØØ,
 HACKBERRY, 2Ø8ØØ
52Ø DATA HEMLOCK, 159ØØ, HICKORY
, 277ØØ, HORNBEAM, 273ØØ
53Ø DATA HARD MAPLE, 24ØØØ, SOFT
 MAPLE, 187ØØ, OAK, 25ØØØ
54Ø DATA JACK PINE, 171ØØ, NORWA
Y PINE, 171ØØ, WHITE PINE, 143ØØ

55Ø DATA SPRUCE, 159ØØ, TAMARACK
,2Ø8ØØ, ALDER, 158ØØ
56Ø DATA DOUGLAS FIR, 176ØØ, LAR
CH, 2Ø8ØØ, PONDEROSA PINE, 181ØØ
57Ø DATA REDWOOD, 183ØØ, STOP, Ø
ØØØØ
58Ø DATA ANTHRACITE COAL, 23ØØØ,
TON,HI VOLATILE BITUMINOUS COAL,
 22ØØØ, TON, LO VOLATILE BITUMIN
OUS COAL,286ØØ, TON
59Ø DATA LIGNITE COAL, 138ØØ, TO
N, NO.1 FUEL OIL, 135, GAL, NO.2
 FUEL OIL, 11Ø, GAL
6ØØ DATA KEROSENE, 135, GAL, PRO
PANE, 91, GAL, NATURAL GAS, 1, C
UBIC FEET
61Ø DATA CHARCOAL, 13, LB, ELECT
RICITY, 3.413, KWH, XXXX, ØØ, XX
62Ø END
63Ø  CLS
64Ø LINE INPUT "WHICH WOOD DO YO
U WANT TO BUY?  ";W$
65Ø PRINT
66Ø READ N$,H
67Ø IF N$="STOP" THEN 91Ø
68Ø IF N$=W$ THEN 7ØØ
69Ø GOTO 66Ø
```

```
7ØØ RESTORE
71Ø PRINT "WHAT IS THE ASKING PR
ICE PER"
72Ø INPUT "CORD IN WHOLE DOLLARS
 ONLY ";P
73Ø PRINT
74Ø PRINT "YOU ENTERED $"P;:INPU
T"RIGHT (Y/N):";Q$
75Ø IF LEFT$(Q$,1)="N" THEN 71Ø
76Ø CLS:X=25ØØØ
77Ø C=INT((P*X)/H+.5)
78Ø E=INT(H/3.413): G=H
79Ø PRINT "A CORD OF ";W$
8ØØ PRINT "AT $";P;" PER CORD"
81Ø PRINT "WOULD BE EQUIVALENT T
O PAYING"
82Ø PRINT"$";C;" FOR A CORD OF O
AK."
83Ø PRINT
84Ø PRINT "FOR A CORD OF ";W$
85Ø PRINT "TOTAL AVAILABLE HEAT
PER CORD ":PRINT"IS"; H/1ØØØ;"MI
LLION BTU"
86Ø PRINT "EQUIVALENT KILOWATT H
OURS OF     ELECTRICITY ARE ";E
87Ø PRINT "EQUIVALENT CUBIC FEET
 OF NATURALGAS ARE ";G
88Ø PRINT: PRINT
89Ø RETURN
9ØØ REM NOT IN DATA
91Ø RESTORE
92Ø PRINT "I DO NOT HAVE THAT WO
OD DATA"
93Ø PRINT "TRY ONE FROM MY DATA
DISPLAY"
94Ø INPUT"DO YOU WANT TO SEE IT?
(Y/N)";Q$
95Ø IF LEFT$(Q$,1)="Y" THEN 98Ø
ELSE RETURN
96Ø RETURN
97Ø REM  DISPLAY WOOD DATA
98Ø CLS:PRINT "HERE IS ALL OF MY
 WOOD DATA."
99Ø FORY=1TO7ØØ:NEXTY
1ØØØ PRINT
1Ø1Ø CLS:PRINT "WOOD TYPE", "MIL
LIONS OF BTU"
1Ø2Ø PRINT "-----------------
------------"
1Ø3Ø FOR Y=1 TO 12
1Ø4Ø READ N$,H
1Ø5Ø IF N$="STOP" THEN 11ØØ
1Ø6Ø PRINT N$,H/1ØØØ
1Ø7Ø NEXT Y
1Ø8Ø INPUT "PRESS <ENTER> TO CON
TINUE";Q$
1Ø9Ø GOTO 1Ø1Ø
11ØØ PRINT
111Ø PRINT "THAT IS ALL MY FIREW
OOD DATA"
112Ø RESTORE
113Ø RETURN
114Ø REM EXPLANATION
115Ø CLS:PRINT "   THIS PROGRAM
WAS WRITTEN IN  OREGON WHERE OAK
 IS MOSTLY THE  STANDARD FIREWOO
D."
116Ø PRINT "   SO, THIS PROGRAM
COMPARES THEHEAT VALUE OF THE WO
OD IN QUEST-ION WITH OAK.";
117Ø PRINT " WHEN ASKED, ENTER T
HE KIND OF WOOD THAT YOU WANT  T
O COMPARE AND THE PRICE THAT ISB
EING ASKED FOR IT PER CORD."
118Ø PRINT "   I WILL THEN COMPA
RE THE HEAT VALUES AND RETURN MY
 ANSWER AS ACOST FOR A CORD OF O
AK.
119Ø PRINT
12ØØ PRINT
121Ø INPUT "PRESS <ENTER> TO CON
TINUE";Q
122Ø CLS:PRINT
123Ø PRINT "FOR EXAMPLE, IF YOU
ENTER 'FIR' AND $5Ø PER CORD, I
WILL ANSWER:"
124Ø PRINT
125Ø PRINT "A CORD OF FIR"
126Ø PRINT "AT $5Ø PER CORD"
127Ø PRINT "WOULD BE EQUIVALENT
TO PAYING"
128Ø PRINT "$87 FOR A CORD OF OA
K."
129Ø PRINT
13ØØ PRINT "I WILL ALSO PRINT TH
E TOTAL HEATVALUE OF A CORD OF T
HE WOOD IN"
131Ø PRINT "QUESTION IN KILOWATT
 HOURS AND  IN CUBIC FEET OF NAT
URAL GAS."
132Ø INPUT "PRESS <ENTER> TO CON
TINUE";Q
133Ø CLS:PRINT
134Ø PRINT"FOR A CORD OF FIR"
135Ø PRINT"TOTAL AVAILABLE HEAT
PER CORD   IS 14.3 MILLION BTU"
136Ø PRINT"EQUIVALENT KILOWATT H
OURS OF    ELECTRICITY ARE 4189"
137Ø PRINT"EQUIVALENT CUBIC FEET
 OF NATURALGAS ARE 143ØØ"
```

Listing continued

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BASIC COMPILER

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   EXP FIX INSTR INT LEN LOG
   LOC LOF PEEK POINT PPOINT RND
   SGN SIN SQR TAN TIMER VAL
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   STR$ STRING$
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   RESET SCREEN SET SOUND
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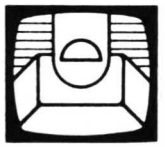

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```
138Ø PRINT
139Ø PRINT "I LEAVE ANY EFFICIEN
CY OR ELECT-RICAL COST CALCULATI
ONS TO YOU."
14ØØ PRINT "I REALLY DON'T HAVE
ROOM FOR ALLOF THE DATA THAT WOU
LD REQUIRE."
141Ø INPUT "PRESS <ENTER> TO CON
TINUE";Q
142Ø RETURN
143Ø REM GENERAL CONVERSION ROUT
INE
144Ø CLS:READ N$,H
145Ø IF N$="STOP" THEN 147Ø ELSE
 144Ø
146Ø GOTO 144Ø
147Ø FOR Y=1 TO 11:READ A$(Y),R(
Y),U$(Y):NEXT Y
148Ø RESTORE
149Ø CLS:PRINT TAB(4)"NON-WOOD H
EAT SOURCES":PRINT
15ØØ FOR Y=1 TO 11
151Ø PRINT Y;TAB(4)A$(Y):NEXTY
152Ø PRINT" 12 CONVERSION EXPLAN
ATION"
153Ø PRINT:INPUT"WHICH ONE(1-12)
";Q
154Ø IF Q=12 THEN 181Ø ELSE 155Ø
155Ø IF Q<1 OR Q>11 THEN 149Ø EL
SE 156Ø
156Ø L=Q
157Ø CLS:PRINT"YOU SELECTED:":PR
INT A$(L)
158Ø INPUT"CORRECT (Y/N)";Q$
159Ø IF LEFT$(Q$,1)="N" THEN 149
Ø ELSE 16ØØ
16ØØ PRINT:PRINT"COMPARED TO WHI
CH WOOD":INPUTW$
161Ø READ N$,H
162Ø IF N$="STOP" THEN 195Ø ELSE
 163Ø
163Ø IF N$=W$ THEN 165Ø ELSE 161
Ø
164Ø GOTO 161Ø
165Ø RESTORE:M=H/R(L):IF U$(L)<>
"TON" THEN V=INT(M+.5):GOTO167Ø
166Ø V=INT(1ØØ*M)/1ØØ
167Ø CLS:PRINT:PRINT
168Ø PRINT"ONE CORD OF ";N$
169Ø PRINT"IS EQUIVALENT TO"
17ØØ PRINTV;U$(L);" OF"
171Ø PRINTA$(L)
172Ø PRINT"FOR A TOTAL HEAT CONT
ENT OF"
173Ø PRINT H/1ØØØ;"MILLION BTU"
174Ø PRINT"AT 1ØØ% EFFICIENCY":P
RINT
175Ø PRINT"ENTER <M> TO RETURN T
O THE MENU"
176Ø PRINT"ENTER <C> FOR A NEW C
ALCULATION"
177Ø INPUT Q$
178Ø IF Q$="M" THEN 32Ø ELSE 179
Ø
179Ø IF Q$="C" THEN 144Ø ELSE 17
7Ø
18ØØ REM GENERAL CONVERSION NOTE
S
181Ø CLS:PRINT"    THIS ROUTINE
WILL MAKE A    COMPARISON OF A C
ORD OF ANY TYPEOF WOOD IN MY DAT
A TO ANY OF THENON-WOOD HEAT SOU
RCES IN MY DATA"
182Ø PRINT"I WILL LIST ALL OF MY
 NON-WOOD  DATA AND YOU CHOOSE T
HE ONE YOU WANT TO KNOW ABOUT.
183Ø PRINT"THEN I WILL ASK WHICH
 WOOD YOU  WANT TO COMPARE AND W
HEN YOU    ENTER A WOOD FROM MY
DATA TABLE I WILL CALCULATE THE
AMOUNT OF"
184Ø PRINT"THE NON-WOOD SOURCE T
HAT IS     EQUIVALENT TO ONE COR
D OF THE   CHOSEN WOOD."
185Ø INPUT"PRESS <ENTER> TO CONT
INUE";Q
186Ø CLS:PRINT:PRINT"FOR EXAMPLE
:":PRINT
187Ø PRINT"SAY YOU WANT TO KNOW
HOW MUCH   ANTHRACITE COAL YOU C
AN REPLACE WITH A CORD OF OAK."
188Ø PRINT"YOU SELECT ANTHRACITE
 COAL FROM THE LIST AND ENTER OA
K AFTER THEPROMPT.  I WILL THEN
RETURN:"
189Ø PRINT:PRINT"ONE CORD OF OAK
 IS EQUIVALENT TO"
19ØØ PRINT"1.Ø8 TON OF ANTHRACIT
E COAL"
191Ø PRINT:PRINT"PRESS ANY KEY"
192Ø Z$=INKEY$:IF Z$=""THEN192Ø
193Ø GOTO144Ø
194Ø RETURN
195Ø RESTORE
196Ø PRINT"I DO NOT HAVE THAT WO
OD DATA"
197Ø PRINT"TRY ONE FROM MY DATA
DISPLAY"
198Ø INPUT"DO YOU WANT TO SEE IT
(Y/N)";Q$
199Ø IF LEFT$(Q$,1)="Y" THEN 98Ø
 ELSE RETURN                    END
```


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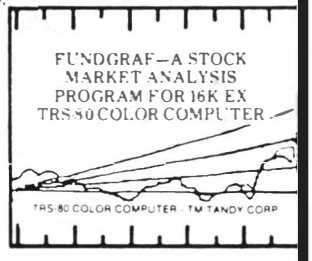

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by Simon Clift

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See the Instant CoCo ad elsewhere in this issue.

MATH INVASION

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Math Invasion is an arcade-style drill-and-practice program for addition, subtraction, multiplication, and division. You can tailor the program to meet the needs of all students—from beginners who need to practice 2 + 2 to more advanced students who can cope with 970 ÷ 5. Because the response time is limited, students can't work problems out on paper. So, Math Invasion gives them a chance to practice "mental arithmetic," too.

Program Operation

At the opening of the program, the supervisor must establish game parameters. The first determines the operations that the game will test. The menu offers you five choices: addition, subtraction, multiplication, division, and continue. When you press a number from one to four, the corresponding mathematic symbol appears below the menu. You can enter a single symbol or any combination of symbols. The more frequently you press a particular number, the more often that operation will be tested. Press 5 (continue) when you are ready to set further parameters.

The program then asks you to input the number of problems needed to complete a game and lets you choose the numeric range of the question: 1–9, 1–99, or 1–999. The program randomly generates the problems' X and Y values so that these values and the answer fall within the range you have chosen. The game speed you select—fast, moderate, or slow—influences the time alotted for a response and thus controls the speed of the invader. At the continue/redo prompt, press C to bring up the next prompt or R to change the parameters.

Press any key to begin the game. A problem appears at the top of the screen, and an invader descends toward the student's base at the bottom. (The base is always directly beneath the invader; no maneuvering is necessary.) If the student types in the correct answer and presses the enter key, the base fires, destroying the invader. If a wrong answer is given, the alien continues downward.

The student may attempt to answer the question again. If the problem has not been solved correctly by the time the invader gets to the base, the base explodes and the computer records the question as an incorrect response.

Students should be encouraged to type multiple digits slowly and accurately; there is ample time to answer each problem. The answers to questions are whole numbers, so students are not required to type fractions or decimals.

When the student has had the opportunity to answer the appropriate number of questions, the program displays a game-over message, a final score, and a rating of the student's performance. The ratings are designed to encourage students who have done poorly and reward students who have done well. ■

System Requirements

16K RAM for cassette systems
32K RAM for disk systems
Extended Color Basic or
Disk Extended Color Basic

Address correspondence to Simon Clift, P.O. Box 787, Kincardine, Ontario, N0G 2G0, Canada.

Program Listing. Math Invasion

```
1Ø ' MATH 'VADERS
2Ø ' BY SIMON CLIFT
3Ø PCLEAR1:CLEAR 4ØØ
4Ø CLSØ:PRINT@224,"**********MAT
H 'VADERS**********"
5Ø PRINT @256,"*********BY SIMON
 CLIFT*********";
6Ø POKE65495,Ø
7Ø PLAY"V31T5L4O2FB-O3DFL8FFL4FD
L8DDL4DL4O2B-O3DO2B-L2F"
8Ø CLS1:PRINT"WOULD THE SUPERVIS
OR PLEASE     ENTER THE GAME PAR
AMETERS NOW..."
9Ø PRINT"1. ADDITION":PRINT"2. S
UBTRACTION":PRINT"3. MULTIPLICAT
ION":PRINT"4. DIVISION":PRINT"5.
 CONTINUE":PRINT"SELECT THE OPER
ATIONS I'LL USE, THE MORE OFTEN
YOU ENTER ONE,THEMORE OFTEN I'LL
 USE IT..."
1ØØ OP$=""
11Ø PRINT@354,OP$+"?"+CHR$(8)+"
"+CHR$(8)+"?":X$=INKEY$:IF X$=""
 THEN 11Ø
12Ø IF X$=CHR$(8) AND LEN(OP$)>Ø
 THEN OP$=LEFT$(OP$,LEN(OP$)-1)
13Ø IF X$="1" THEN OP$=OP$+"+" E
LSE IF X$="2" THEN OP$=OP$+"-" E
LSE IF X$="3" THEN OP$=OP$+"*" E
LSE IF X$="4" THEN OP$=OP$+"/" E
LSE IF X$="5" THEN 16Ø
14Ø GOTO 11Ø
15Ø IF OP$="" THEN 11Ø
16Ø PRINT@416,;:INPUT"NUMBER OF
QUESTIONS";NQ
17Ø IF NQ<1 THEN 16Ø
18Ø CLS: PRINT"ENTER RANGE OF NU
MBERS TO BE    USED OR PRODUCED:
"
19Ø PRINT"1. 1-9":PRINT"2. 1-99"
:PRINT"3. 1-999":PRINT"SELECT OP
TION:";
2ØØ X$=INKEY$:IF X$="" THEN 2ØØ
ELSE IF X$<"1" OR X$>"3" THEN 2Ø
Ø ELSE PRINTX$:FORI=1TO5ØØ:NEXTI

21Ø NR=INT(9.99*1Ø^(VAL(X$)-1))
22Ø PRINT:PRINT"ENTER GAME SPEED
:":PRINT"1. FAST":PRINT"2. MODER
ATE":PRINT"3. SLOW":PRINT"SELECT
:";
23Ø X$=INKEY$:IF X$<"1" OR X$>"3
" THEN 23Ø ELSE PRINTX$:FORI=1TO
5ØØ:NEXTI:GS=VAL(X$)
24Ø PRINT:PRINT"DO YOU WISH TO C
ONTINUE OR REDO?          (C/R
)"
25Ø X$=INKEY$:IF X$="R" THEN 8Ø
ELSE IF X$<>"C" THEN 25Ø
26Ø CLSØ:FORI=ØTO6:PRINTSTRING$(
64,128+I*16);:NEXTI:BX=32:SC=Ø:G
OSUB58Ø:CN=Ø:PRINT@ØØ,"PRESS ANY
KEY TO START...";
27Ø IF INKEY$="" THEN 27Ø
28Ø PLAY"T5L15O2CEGCEGECG":O$=MI
D$(OP$,RND(LEN(OP$)),1)
29Ø IF O$="+"THENAN=RND(NR):A=RN
D(AN):B=AN-A
3ØØ IF O$="-"THENA=RND(NR):B=RND
(A):AN=A-B
31Ø IF O$="*"THEN A=RND(INT(SQR(
NR))): B=RND(INT(SQR(NR))):AN=A*
B
32Ø IF O$="/"THEN AN=RND(INT(SQR
(NR))):B=RND(INT(SQR(NR))):A=AN*
B
33Ø PRINT@Ø, "SOLVE:";A;O$;B;"=?
"
34Ø AN$="":IY=6:CN=CN+1:GOSUB 6Ø
Ø
35Ø FORI=1TOGS*3Ø:X$=INKEY$:IF X
$="" THEN 36Ø ELSE IF (X$>="Ø" A
ND X$<="9")OR X$=CHR$(13) OR X$=
CHR$(8) THEN 43Ø
36Ø NEXTI
37Ø D=RND(3)-2:IF BX<5 THEN D=1
ELSE IF BX>27 THEN D=-1
38Ø GOSUB59Ø:GOSUB61Ø:BX=BX+D:IY
=IY+2
39Ø GOSUB58Ø:GOSUB6ØØ
4ØØ IF IY=3Ø THEN 48Ø
41Ø SOUND1,1
42Ø GOTO 35Ø
43Ø IF X$>="Ø" THEN AN$=AN$+X$:P
RINT@23,AN$;:GOTO 35Ø
44Ø IF X$=CHR$(13) THEN IF VAL (
AN$)=AN THEN PRINT@19,AN$;:PRINT
@23,"RIGHT!!!";:GOSUB 57Ø:SC=SC+
1:PLAY"L255T255O4CDEFGABBAGFEDC"
:GOSUB 61Ø:GOTO47ØELSE PRINT@23,
"WRONG";:PLAY"T3L1O1C":AN$="":PR
INT@23,"     ";:GOTO 35Ø
45Ø IF X$=CHR$(8) AND LEN(AN$)>Ø
 THEN AN$=LEFT$(AN$,LEN(AN$)-1):
PRINT@23,AN$+" "
46Ø GOTO 35Ø
47Ø IF CN=NQ THEN 49Ø ELSE 28Ø
48Ø GOSUB 62Ø:PRINT@19,AN;"IS RI
GHT";:PLAY"L4T4O2CE-CE-CE-CE-":F
ORI=1 TO 1ØØØ:NEXTI:IF CN<NQ THE
N 28Ø
49Ø PRINT@268,"GAME OVER";:PLAY"
L2ØT5O5BAGFEDCO4BAGFEDCO3BAGFEDC
O2BAGFEDCO1BAGFEDC"
5ØØ CLS:PRINT"O.K.  YOU SCORED";
SC;" RIGHT":PRINT"OUT OF";NQ;"."
:PRINT"THAT IS";INT(1ØØ*(SC/NQ))
;"PERCENT..."
51Ø IF SC/NQ<.5 THEN R$="YOU NEE
D TO CHECK UP ON HOW TO  DO THE
QUESTIONS; THEN PRACTICE AGAIN."
52Ø IF SC/NQ>=.5 AND SC/NQ<.65 T
HEN R$="YOU NEED MORE PRACTICE,
BUT THATWASN'T TOO BAD."
53Ø IF SC/NQ>=.65 AND SC/NQ<.85
THEN R$="VERY GOOD, BUT YOU STIL
L COULD  USE A BIT MORE PRACTICE
 AT THIS  LEVEL."
54Ø IF SC/NQ>=.85 THEN R$="EXCEL
LENT!! MOVE UP A LEVEL, YOUKNOW
WHAT YOU ARE DOING!!"
55Ø PRINTR$:PRINT@448,"PRESS '*'
 TO RESET LEVEL OR 'P' TO PLAY A
GAIN...";
56Ø X$=INKEY$:IF X$="" THEN 56Ø
ELSE IF X$="P" THEN 26Ø ELSE IF
X$="*" THEN RUN ELSE 56Ø
57Ø FORI=28 TO IY-2 STEP-1:RESET
(BX+3,I+1):SET(BX+3,I,Ø):SOUND25
5-I*8,1:NEXT:FORI=1TO2Ø:PLAY"L25
5T255O1CEDG":SET(BX+RND(6),IY-RN
D(3),RND(8)):NEXTI:FORI=1TO6:FOR
J=1TO3:RESET(BX+I,IY-J):NEXTJ,I:
RETURN
58Ø FORI=1TO3:FORJ=1TO(I+I-1):SE
T(3+BX+J-I,28+I,5):NEXTJ,I:RETUR
N
59Ø FORI=1TO3:FORJ=1TO(I+I-1):RE
SET(3+BX+J-I,28+I):NEXTJ,I:RETUR
N
6ØØ FORI=1TO6:SET(BX+I,IY-I/2,Ø)
:SET(BX+6-I,IY-I/2,Ø):NEXT:RETUR
N
61Ø FORI=1TO6:RESET(BX+I,IY-I/2)
:RESET(BX+6-I,IY-I/2):NEXT:RETUR
N
62Ø FORI=1TO2Ø:SET(BX+RND(5),28+
RND(3),RND(8)):PLAY"L255T255O1CG
DF":NEXTI:FORI=BX TO BX+5:FORJ=2
9TO31:RESET(I,J):NEXTJ,I:GOSUB61
Ø:RETURN
```


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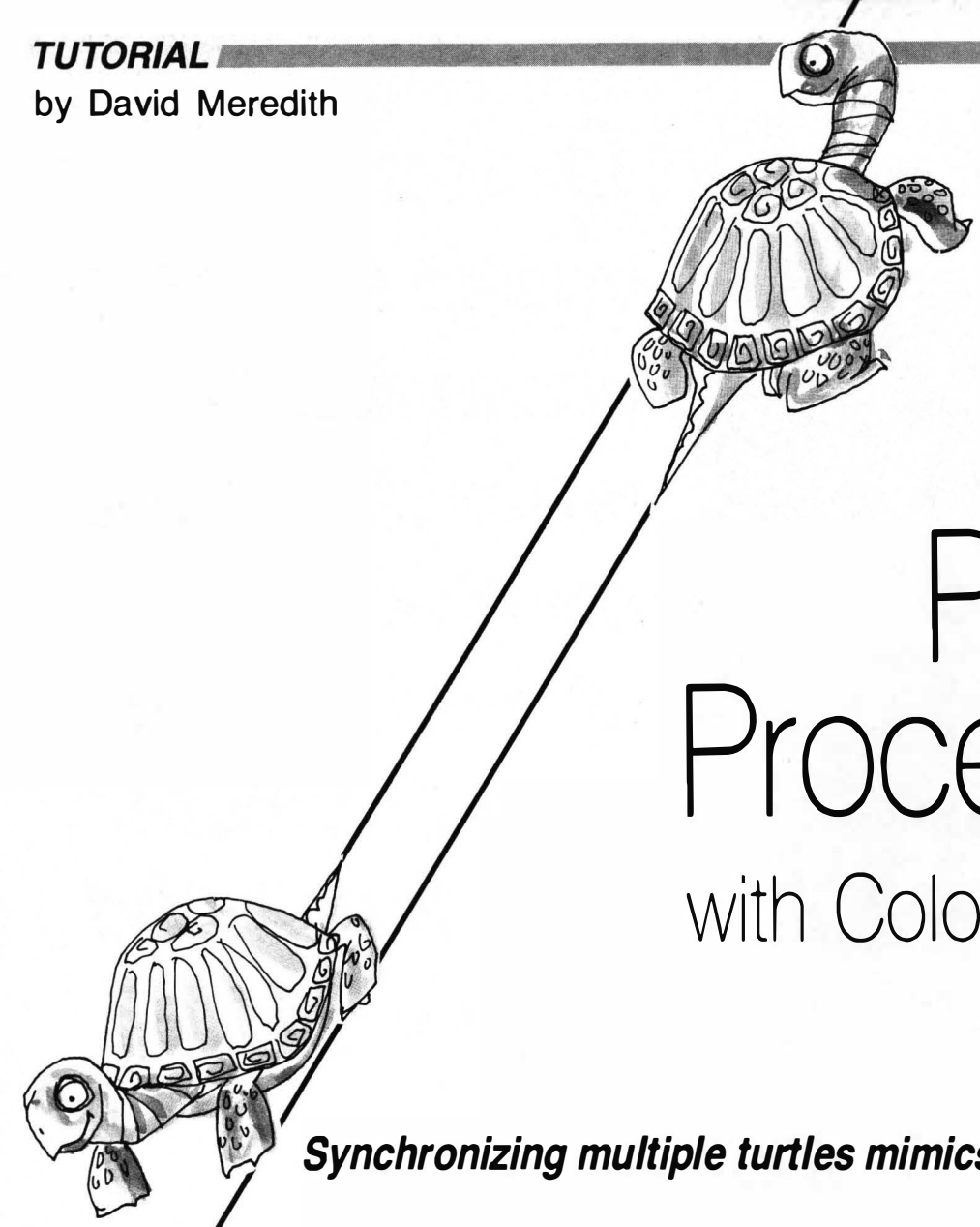
by David Meredith



Parallel Processing with Color Logo

Synchronizing multiple turtles mimics parallel processing.

Illustration by Dianne Ritson

Parallel processing is the hottest topic in computerland these days. With CPUs as cheap as a dollar or two, it is feasible to build a computer with 10 or even 1,000 processors operating in parallel. These parallel computers will vastly increase the speed of database searches and vector operations like spreadsheets and graphics. They may even achieve some of the goals of artificial intelligence, such as speech recognition and problem solving.

Multiple-processor computers have already been built at Cal Tech and Columbia University, while companies like DEC, IBM, and Cray Research are known to be working on similar technology. Japanese researchers are basing their Fifth Generation project on parallel computation. A recent meeting of university, government, and industrial computer scientists reported, "We are entering a new era in very high-performance computing that will be dominated by parallel-architectured systems." (*Comm. ACM, August 1984, p. 747.*)

Parallel processing will first appear on large, expensive mainframe computers, but it might filter down to personal computers before long. The greatest obstacle confronting parallel processing is designing software to take advantage of parallel hardware. Effective parallel algorithms are only now being developed.

You and your CoCo can join the parallel-processing revolution now and experiment with parallel processing using Tandy's Color Logo. Logo's multiple turtles can operate simultaneously and communicate with each other like independent CPUs. Who knows—perhaps a CoCo owner will invent a new algorithm for the parallel hardware now being developed.

System Requirements

16K RAM
Color Basic
Tandy Color Logo

Programming Multiple Turtles

Programming multiple turtles is like organizing a group of people. Each turtle is assigned a job and taught to do it. That is, each turtle is given a program to follow. You don't write a single program or a main routine with subroutines. Instead, you write a separate program for each turtle, including instructions for synchronizing with the other turtles. When the overall task is set in motion, the turtles communicate with each other to coordinate their processing.

In some parallel programs, the turtles talk to each other. Listing 1 contains a short example of this sort. On the command RACE N, N turtles race across the screen. More pre-

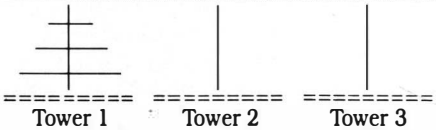
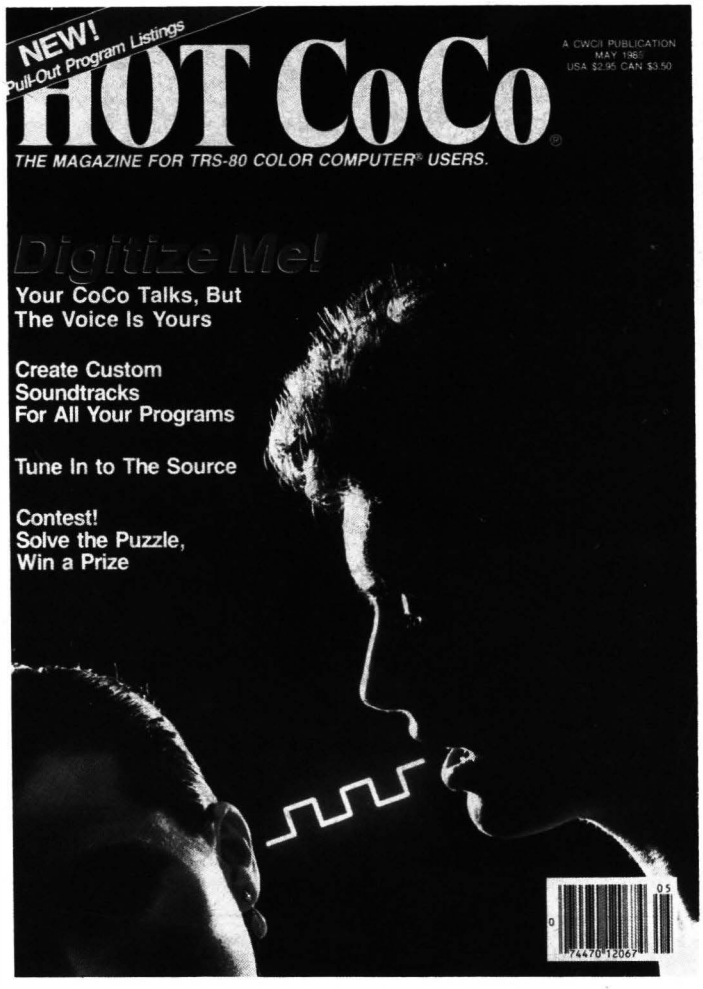


Fig. 1. Starting Position for the Towers of Hanoi with Three Rings on the First Tower



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cisely, N – 1 turtles race and one sits up. It stops for a random length of time; then it sends a message to stop another turtle and begins running again.

In other programs, a master turtle controls subordinate turtles. All communication is between the master turtle and its subordinates. The main program in this article (Listing 2) uses a master turtle and subordinate turtles to solve the Towers of Hanoi puzzle.

The Towers of Hanoi

The ancient Towers of Hanoi puzzle consists of three pegs or towers placed upright and a small set of rings of graded sizes. The rings are initially placed on tower 1, with the largest on the bottom and the smallest on the top (Fig. 1). The object of the puzzle is to move the rings to tower 3. You can only move one ring at a time, and you cannot place a ring on a smaller ring. When you are done, the rings should be stacked on tower 3, with the largest on the bottom and the smallest on the top.

Table 1 contains a solution to the puzzle for three rings. You can try this solution yourself. Draw three circles on a piece of paper; label them 1, 2, and 3; stack three different coins in circle 1. Now follow the instructions in Table 1 to move the coins to circle 3. Can you solve the puzzle for four coins? How many moves does it take? How many moves does it take with four towers instead of three?

All rings start on tower 1

Move ring 1 to tower 3
Move ring 2 to tower 2
Move ring 1 to tower 2
Move ring 3 to tower 3
Move ring 1 to tower 1
Move ring 2 to tower 3
Move ring 1 to tower 3

Table 1. How to Move Three Rings from Tower 1 to Tower 3

Listing 2 contains a Logo solution to the puzzle using parallel processing. It displays a moving picture of the puzzle being solved.

Before discussing the details of this program, let's look at its underlying algorithm. Think of Table 2 as the directions for improving your ability to solve the puzzle. If you could move three rings from one tower to another, then Table 2 would show you how to move four rings. First, move the top three rings from the source tower to the extra tower (you already know how to move three rings). Then move the bottom ring from the source tower to the target tower (that involves moving one ring). Finally, move the top three rings from the extra tower to the target tower (you move three rings again).

Table 2 solves the puzzle completely. It solves the puzzle if there aren't any rings left (you don't do anything); it also extends the solution from any level to the next. So, it solves the puzzle for any number of rings.

The algorithm in Table 2 is called recursive because it calls itself. Recursion is one of the tricks of the Logo programmer. You can read more about it in the Color Logo manual, pp. 43–52. (See also pp. 28 and 116 on local variables.)

Logo Solution

The Logo solution to the Towers of Hanoi puzzle (Listing 2) uses a master turtle (turtle 0) and subordinate turtles. The subordinate turtles are tower turtles and ring turtles.

The master turtle is controlled by the pro-

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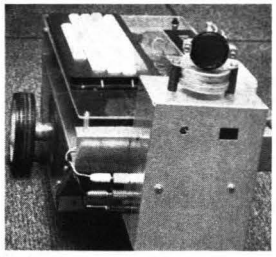

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To move a stack of N rings from tower A to tower B

```
If N > 0 Then
    C = 6 – A – B
    move stack of N – 1 rings from tower
    A to tower C
    move ring N to tower B
    move stack of N – 1 rings from tower
    C to tower B
```

Table 2. Solution to puzzle given as an algorithm for moving a stack of N rings from tower A to tower B. If N = 0, there are no rings to move, so nothing happens. If A and B are two tower numbers, then C = 6 – A – B is the third tower number.

cedure HANOI and its subprocedures SETUP and MOVE. SETUP clears the screen and creates the ring and tower turtles. MOVE, which is modeled on Table 2, solves the puzzle by moving the rings. The command SEND :N :B tells ring turtle N to move to tower B.

Tower turtles are numbered 101, 102, and 103 for towers 1, 2, and 3. Each is controlled by the procedure, TOWER. Tower turtles always occupy the lowest unused position on their tower, although they are not visible on the screen. When they receive the message, 2, in the mail, they move up one position; they move down one position when they receive a 1. They tell the moving rings where to land at the end of a move. (You can make the tower turtles visible by removing the command HT from TOWER.)

Ring turtles, numbered 1. . .N, correspond to the rings on the towers. They look like rings turned on edge, they sit stacked on the towers, and on command from the master turtle, they move to another tower.

Each ring turtle is controlled by the procedure RING. This procedure first places the ring turtle at its starting position on tower 1. Then it waits for a message from the master turtle. Upon receiving the message T2 from the master turtle, RING moves the ring to tower T2 and sends a confirmation message back to the master turtle.

As each ring moves, it sends a message 1 to the tower it is leaving and a 2 to the tower for which it is headed. This causes the tower turtles to correct their positions on their towers in preparation for receiving the next ring. The master turtle and its subordinate ring and tower turtles are alive and operating simultaneously.

Two questions remain to be answered. How can the ring and tower turtles follow just two procedures, RING and TOWER, and yet not all do the same thing? How can they operate simultaneously? An analogy might help answer the first question. An income-tax form is a procedure. Everyone fills out the same tax form according to the same rules, but because people have different incomes and deductions, they don't fill it out the same way.

Similarly, several turtles can follow the same procedure in different ways. Each turtle has its own shape, its own name (ME), its own mail, and its own set of variables. For example, if ring turtles 1 and 2 are on different towers, they have different values in their variables :T1. Differences in their data lead different turtles to follow the same procedure in different ways.

There is, however, only one CPU in your CoCo. The Logo interpreter mimics parallel operation with a time-sharing trick. After an instruction for one turtle is executed, the interpreter switches to the next turtle. The interpreter cycles through all the turtles and then begins again with the next instruction for each one. If you observe the operation of Listing 1 closely, you can see that two turtles never move at exactly the same time.

I hope I've interested you in exploring parallel processing further. More information can be found in the Color Logo manual as well as in texts and articles on parallel processing and Ada. I've listed three classics and one up-to-date text in the bibliography (Table 3). Despite their forbidding titles, they are accessible to anyone who knows a little Pascal. ■

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Hoare, C.A.R., "Communicating Sequential Processes," *COMM. ACM*, v.21, no. 8, pp. 666–677, August 1978.

Table 3. Bibliography

David Meredith is a professor of mathematics at San Francisco State University. Address correspondence to him at the Dept. of Mathematics, 1600 Holloway Ave., San Francisco, CA 94132.

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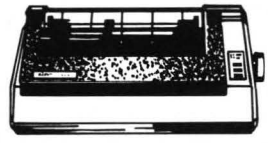

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A Brief Introduction to Logo

Logo is a computer language widely used to introduce children to programming. But Logo is neither simple nor childish. It was designed to be a complete programming environment with special graphics features; anything you can do with Basic, you can do with Logo. Moreover, Logo is modular and readable. You can develop a Logo program as a series of procedures and use long variable and procedure names.

The key object in Logo is the turtle. If the metaphor for a Basic program is a list of instructions for a computer to follow, then a Logo program is a list of instructions for a turtle to follow. A Logo programmer is always directing a turtle on the screen. The turtle can receive keystrokes, print messages, and draw pictures with its pen by moving about the screen. The turtle is always located on the screen headed in a specific direction. Table 4 lists commands that move the turtle or affect the pen.

FD N	move forward N steps
LT N	turn left N degrees
RT N	turn right N degrees
HT	hide the turtle
ST	show the turtle
PU	lift the turtle's pen
PD	lower the turtle's pen
PC N	change the pen's color to N
SHAPE. . .	change the shape of the turtle

Table 4. Logo Commands

Logo procedures can include variables. Variable names are strings preceded by a colon, like :N. To assign :N the value 3, execute "MAKE :N 3".

Program control is given by IF, ELSE, REPEAT, and WHILE (there are no GOTOs). Each control statement is followed by a block of instructions to execute; the block is delimited by parentheses. For example, to move forward eight steps :R times, use REPEAT :R (FD 8). The instruction block can contain more than one line.

The principle program unit in Logo is not the line but the procedure. Procedures begin with TO, and invoke each other. The main procedure can be started by invoking its name and any necessary parameters from the keyboard in run mode. For example, to run the Towers of Hanoi animation in Listing 2 for three rings, you type HANOI 3 from run mode. HANOI in turn invokes SETUP and MOVE, and RING invokes F.

Tandy's Color Logo includes a multiple-turtle facility not found in other Logos. You always start with one turtle—turtle 0. You can create additional turtles numbered 1 through 254 with the command, HATCH. Each newly created turtle must be assigned a program. The command HATCH 101 TOWER :N creates Turtle 101, assigns it the program Tower, and passes the parameter :N to TOWER.

Turtles can exchange messages that are numbers between −32768 and 32767. To send a message m to turtle B, execute SEND B m. The message m can be a constant or a variable. Notice that you don't have to specify which turtle is sending the message; the turtle executing the program in which the command appears is the one sending the message.

Messages are held until called for. To request mail sent by turtle T, a turtle executes the function MAIL T. The function MAIL 255 returns the oldest message waiting to be delivered to the turtle. ■

Program Listing 1. Race N turtles across the screen.

```
RUN A RACE

RACE CREATES N TURTLES THAT
RACE ACROSS THE SCREEN. AT ANY
TIME ONE TURTLE ISN'T MOVING.
SEND COMMAND FREEZES A RANDOM
TURTLE TO START.

TO RACE :N
  CLEAR HT NOWRAP
  SX 0 SY 16 SH 90
  MAKE :I 1
  REPEAT :N
  ( SY ((YLOC ME) + 16)
    HATCH :I STOPANDGO :N
    MAKE :I :I + 1
  )
  SEND ((RANDOM :N) + 1) 1
  VANISH
END

STOPANDGO DIRECTS RUNNER TUR-
TLES. A TURTLE GOES UNTIL IT RE-
CEIVES MAIL. THEN IT STOPS FOR A
RANDOM LENGTH OF TIME, SENDS A
MESSAGE TO STOP ANOTHER RUN-
NER TURTLE SELECTED AT RANDOM,
AND RESUMES RUNNING ITSELF.

TO STOPANDGO :N
  PU PRINT ME FD 8 PD
  PC ME - 3*(ME/3)
  WHILE 1
  ( IF NOT MAIL 255
    ( FD 5)
    ELSE
    ( LT 90
      WHILE RANDOM 6( )
      SEND ((RANDOM :N) + 1) 1
      RT 90
    )
  )
END
```

Program Listing 2. Hanoi displays a solution to the Towers of Hanoi puzzle with N rings.

```
TOWERS OF HANOI

TO DISPLAY ANIMATED SOLUTION TO
TOWERS OF HANOI PUZZLE WITH N
RINGS. INVOKE "HANOI N".

THE PROGRAM USES THREE TOWER
TURTLES AND N RING TURTLES MOV-
ING BETWEEN THE TOWERS.

THE ROUTINE IS LIMITED BY MAKEME
TO 6 RINGS

TO HANOI :N
  SETUP :N
  MOVESTACK :N 1 3
END

SETUP ESTABLISHES THREE TOWERS
WITH :N RINGS ON THE FIRST TOWER.
:RINGNUM AND :HEIGHT ARE LOCAL
VARIABLES.

TO SETUP :N :RINGNUM :HEIGHT
  CLEAR PU HT
  HATCH 101 TOWER :N
  HATCH 102 TOWER :N
  HATCH 103 TOWER :N
  MAKE :RINGNUM :N
  MAKE :HEIGHT 64
  REPEAT :N
  ( HATCH :RINGNUM RING :HEIGHT
    MAKE :RINGNUM :RINGNUM - 1
    MAKE :HEIGHT :HEIGHT + 8
  )
END
```

Listing continued

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MOVESTACK MOVES A STACK OF M RINGS FROM TOWER :A TO :B. TO MOVE RING :M TO TOWER :B, A MESSAGE :B IS SENT TO RING TURTLE M (CONTROLLED BY PROC. RING). AFTER ISSUING THE ORDER TO MOVE RING TURTLE M, MOVESTACK WAITS FOR CONFIRMATION OF COMPLETION OF MOVE BEFORE CONTINUING. :C IS A LOCAL VARIABLE.

```
TO MOVESTACK :M :A :B :C
  IF :M = 0 (STOP)
  MAKE :C 6 - :A - :B
  MOVESTACK (:M - 1) :A :C
  SEND :M :B
  WHILE NOT MAIL :M ( )
  MOVESTACK (:M - 1) :C :B
END
```

TOWER CONTROLS TOWER TURTLES 101-103. EACH TOWER TURTLE DRAWS ITS TOWER, AND THEN SITS IN THE LOWEST UNUSED POSITION. IT MOVES UP OR DOWN WHEN MAIL SAYS A RING HAS LEFT OR ARRIVED. :MSG IS A LOCAL VARIABLE.

```
TO TOWER :N :MSG
  HT PC 2
  SX 64*(ME - 100)
  SY 56
  SH 90 FD 8 BK 16 FD 8
  LT 90 FD (8*(:N + 1))
  PU
  IF ME = 101 (SY (56 + 8*(:N + 1)))
  ELSE (SY 64)
  WHILE 1
  ( MAKE :MSG MAIL 255
  IF :MSG = 1 (BK 8)
  ELSE
  ( IF :MSG = 2 (FD 8))
)
END
```

RING CONTROLS RING TURTLES 1...N. H1 IS THE INITIAL HEIGHT OF THE RING TURTLE ON STACK 1 (FROM SETUP). H1, T1 STORE CURRENT HEIGHT AND TOWER NUMBER OF RING. UPON RECEIVING MESSAGE T2 (FROM MOVESTACK), RING MOVES RING TURTLE TO TOWER T2 AND RESETS (BY MAIL) THE AFFECTED TOWERS. T1, H2, T2 ARE LOCAL VARIABLES.

```
TO RING :H1 :T1 :H2 :T2
  PU HT SH 0
  MAKE :T1 101
  SX 64 SY :H1
  MAKEME
  ST
  WHILE 1
  ( MAKE :T2 MAIL 0
    IF :T2 < >0
    ( MAKE :T2 100 + :T2
      MAKE :H2 YLOC :T2
      SEND :T1 1
      SEND :T2 2
      F (120 - :H1)
      IF :T2 > :T1 (SH 90)
      ELSE (SH 270)
      F (ABS(:T2 - :T1)*64)
      SH 180 F (120 - :H2)
      SH 0
      SEND 0 1
      MAKE :T1 :T2
      MAKE :H1 :H2
    )
  )
END
```

F MOVES A TURTLE A DISTANCE :D, STOPPING PERIODICALLY TO SHOW THE TURTLE. THIS ANIMATES THE MOVEMENT.

```
TO F :D
  REPEAT :D/8
  ( FD 8)
END
```

MAKEME GIVES SHAPE TO RING TURTLE N < = 6.

```
TO MAKEME
  IF ME = 1
  ( SHAPE RRUBBBDFFFFFFUBBB
    STOP)
  IF ME = 2
  ( SHAPE RRUBBBBBBDFFFFFFFFFFF-
FUBBBBBB
    STOP)
  IF ME = 3
  ( SHAPE RRUBBBBBBBBBDFFFFFFF-
FFFFFFFFFFFUBBBBBBBBB
  IF ME = 4
  ( SHAPE RR-
UBBBBBBBBBBBBDFFFFFFFFFFFF-
FFFFFFFFFFFFUBBBBBBBBBBB
    STOP)
  IF ME = 5
  ( SHAPE RRUBBBBBBBBBBBBBBBB-
BDFFFFFFFFFFFFFFFFFFFFFFF
FFFFFUBBBBBBBBBBBBB
    STOP)
  IF ME = 6
  ( SHAPE RRUBBBBBBBBBBBBBBB
BBDFFFFFFFFFFFFFFFFFFFFFFF-
FFFFFFFFFFFUBBBBBBBBBBBB-
BBBBB
    STOP)
END
```


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LINKED LISTS in Basic

Hook up with a more effective method for sorting lists.

If you've ever struggled with maintaining a sorted list in arrays, Linksort is for you. (See Listing.) It demonstrates the use of linked lists in Basic and can be used in hobby and business applications.

What Are Linked Lists?

A linked list is a dynamic data structure used in languages like Pascal. The size of the list can increase or decrease as the number of elements changes. Arrays and other data structures stored in memory are static—their dimensions are declared early in the program with a DIM statement. When you want to insert or delete information and yet maintain data in alphabetical order, arrays can cause headaches. If the list is arranged contiguously (organized from top to bottom, as in Fig. 1), insertion or deletion requires shifting part of the array up or down by one place (Fig. 2). If the array is large, this process can take time.

In Pascal, linked lists provide a way of avoiding these problems. Figure 3 will help you understand the underlying concept. The variable, FIRST, points to the first cell. The left portion of each cell contains the name; the right segment contains the pointer that links the cell to the next element in the list. The exact location of each cell within the array is of no consequence.

Representing linked lists in arrays is powerful in languages such as Basic, Fortran, and Cobol, which don't have pointers and dynamic storage. Setting up the list is simple. Linksort uses four arrays: NAME$, which holds the names in the list; PTR, which provides the link to the next cell in the list; BALANCE, which holds the customer's balance; and AVAIL, which is used to delete names from the list and keep track of the positions of deleted cells. The number of names in the list is represented by the variable, NUMBER.

Figure 4 shows an example of a list containing 10 names that are linked in alphabetical order but arranged randomly. This can be confusing, but if you think in terms of the links—not the array—the concept should be easier to grasp. If you trace through the table you will see that the linking between cells places the names in alphabetical order. PTR(0) marks the first name in the list, NAME$(7)—Amy, in this case. PTR(7) contains 4, which means that the next name is NAME$(4), Bill. To check the remainder of the list, proceed in the same manner, looking in PTR for the subscript of the name in NAME$ and using that subscript to tell you what the next PTR value is. The zero in PTR(8) signifies that its corresponding element in NAME$ is the last name in the list.

	NAME$
1	Amy
2	Bill
3	Cathy
4	Dave
5	Gary
6	Jill
7	Ken
8	Mike
9	Pete
10	Sue
11	
12	

Fig. 1. List Ordered from Top to Bottom

	NAME$
1	Amy
2	Ben
3	Bill
4	Cathy
5	Dave
6	Gary
7	Jill
8	Ken
9	Mike
10	Pete
11	Sue
12	

Fig. 2. Inserting a New Element into a List

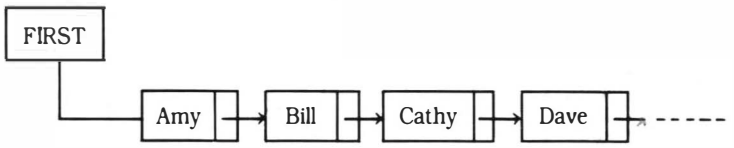

Fig. 3. Linked Cells

System Requirements

16K RAM
Color Basic
Printer Optional

	NAME$		PTR	
0		0	7	Points to "Amy"
1	Cathy	1	5	
2	Jill	2	6	
3	Pete	3	8	
4	Bill	4	1	Third name—"Cathy"
5	Dave	5	10	
6	Ken	6	9	
7	Amy	7	4	Second name—"Bill"
8	Sue	8	0	
9	Mike	9	3	
10	Gary	10	2	
11		11		
12		12		

Fig. 4. Linked List

Inserting Information

The real power of linked lists lies in inserting and deleting cells. Figure 5 shows how the name, Ben, would be inserted into the list. If you were not using a linked array, Ben would be placed between Amy and Bill by shifting Bill and the names that follow down one cell and inserting Ben in the empty cell (Fig. 2). With linked lists, you can simply insert additions into the next empty cell and change the appropriate pointers. To better understand this process, refer to lines 900–1010, the Search for Insert routine, and lines 1020–1220, the Insert Customer routine. The variable TEMP points to the current name in the list and BACK points to the name immediately preceding it. Trace through the code with the example for Ben, keeping track of the values of P, BACK, TEMP, and the procedure should become clear.

Problems with Deletion

Deleting names isn't quite as easy as inserting them; the structure of arrays can cause problems. After an entry is deleted, that cell still takes up space in the array, thus wasting memory. To overcome this difficulty, Linksort uses the array, AVAIL, and the variable, COUNT, to keep track of the number of cells available for insertion. A second variable, DCELL, keeps track of the next available cell in NAME$ (and its counterpart, PTR). AVAIL records the locations (subscripts) of deleted cells; as each cell is deleted, its position is stored in AVAIL, to be filled when the next insertion is made.

In Fig. 6, Ben has been deleted from the list. The name hasn't been removed from the array, but the pointers are set to move from Amy to Bill. DCELL contains the subscript of the next available cell—11 in this case.

To understand deletion, trace the Search and Delete routine (lines 1230–1380). The routine reads in the name to be deleted as DE$ and searches the list from the first element to the last, comparing each name to DE$. If a match is found, the program calls the Delete Customer routine (lines 1390–1470). The cell is deleted by changing the BACK pointer; the position of the deleted cell, 11, is stored in AVAIL and used for the next insert. If no match is found, an error message is printed because the name is not in the list.

The Search for Insert and Insert Customer routines check COUNT before adding a new name as the last element in the list. If its value is greater than zero, there are empty cells within the list. The routine inserts the new name in the cell to which DCELL points and changes BACK to point to it. If there are no available cells within the list, the name is inserted at the end of the list.

Using Linksort

After displaying preliminary prompts for cassette, disk drive, and printer, Linksort brings up a menu with six options:

1 Create File
2 Read File
3 Insert New Name
4 Delete Name
5 Print the List
6 Save and Exit

	NAME$		PTR
0		0	7
1	Cathy	1	5
2	Jill	2	6
3	Pete	3	8
4	Bill	4	1
5	Dave	5	10
6	Ken	6	9
7	Amy	7	11
8	Sue	8	0
9	Mike	9	3
10	Gary	10	2
11	Ben	11	4
12		12	

Fig. 5. Inserting an Element in a Linked List

	NAME$		PTR		AVAIL	
0		0	7	0		
1	Cathy	1	5	1	11	COUNT
2	Jill	2	6	2		
3	Pete	3	8	3		
4	Bill	4	1	4		
5	Dave	5	10	5		
6	Ken	6	9	6		
BACK 7	Amy	7	4	7		
8	Sue	8	0	8		
9	Mike	9	3	9		
10	Gary	10	2	10		
TEMP 11	Ben	11	4	11		
12		12		12		

Fig. 6. Deleting an Element from a Linked List

Each menu item corresponds to a subroutine within the program. I have documented the start of each block to simplify debugging and modification. (See Table 1 for a list of program variables.) If you need to restructure the program, you will only need to rearrange a few lines in the main loop.

Linksort should work in all versions of Basic. I used it on an IBM PC and it ran fine. The only limitation on creating additional records or increasing the number of customers is the amount of memory your computer has.

BALANCE holds the balance of the corresponding name in NAME$; e.g., BALANCE(37) holds the balance for NAME$(37). You can easily create large records by adding other parallel arrays, such as ADDRESS and ACCTNO, and a few lines of code to update them whenever NAME$ is affected. You can also add routines to update a customer's balance, perform transactions, keep track of inventory, maintain a recipe file, and so on. Experiment with the program; you will learn more that way and might develop powerful applications for it.

Linked lists in Basic are an efficient way of creating and sorting lists of any kind. When you create a new file, you can enter the names in any order because they are alphabetized as you enter them. And you needn't confine the list to names: Linksort will alphabetize any character. Once you become comfortable with the concept and methods used, I'm sure you'll use them for all of your list-management programs. ■

NAME$	Array to hold customer names.
PTR	Pointer array.
BALANCE	Array to hold customer balances.
AVAIL	Available (deleted) cell array.
DEVICE	Tape or disk identifier.
HC$	Send output to printer.
CUS$	Input customer name.
AMT	Input customer balance.
NUMBER	Number of customers in list.
TEMP	Link to next name in array NAME$.
DCELL	Position in NAME$ of previously deleted cell.
DE$	Input name of customer to delete.
BACK	Pointer to name preceding current name.
COUNT	Number of available (deleted) cells.

Table 1. Program Variables

Address correspondence to Bruce Bauder, 910 Meadow Ave., Tillamook, OR 97141.

Program Listing. Linksort

```
10 CLS:PMODE 0:PCLEAR 1:CLEAR 30
00
20 DIM NAME$(100),PTR(100),BALAN
CE(100),AVAIL(100)
30 PRINT@139,"-LINKSORT-":PRINT
40 PRINT@170,"A LINKED LIST"
50 PRINT@197,"FILE MANAGEMENT PR
OGRAM"
60 PRINT@233,"BY BRUCE BAUDER"
70 PRINT@266,"MARCH 5, 1984"
80 SCREEN 0,1
90 FOR T=1 TO 1500:NEXT
100 CLS:INPUT "TAPE(T) OR DISK(D
)";IO$
110 IF IO$="T" THEN DEVICE=-1 EL
SE IF IO$="D" THEN DEVICE=1 ELSE
 100
120 INPUT "OUTPUT LIST TO PRINTE
R (Y/N)";HC$:IF HC$ <> "Y" AND H
C$ <> "N" THEN 120
```


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```
13Ø IF HC$="Y" THEN PRINT:PRINT
"MAKE SURE PRINTER IS READY.":FO
R Y = 1 TO 1ØØØ:NEXT
14Ø '
15Ø '*************************
16Ø '*  MAIN LOOP STARTS HERE *
17Ø '*************************
18Ø CLS 6
19Ø PRINT@Ø,STRING$(32,"*");
2ØØ PRINT@1Ø3,"<ENTER CHOICE NUM
BER>";
21Ø PRINT@135,STRING$(21,"*");
22Ø PRINT@199,"1) CREATE FILE
  ";
23Ø PRINT@231,"2) READ FILE
  ";
24Ø PRINT@263,"3) INSERT NEW NAM
E ";
25Ø PRINT@295,"4) DELETE NAME
  ";
26Ø PRINT@327,"5) PRINT THE LIST
  ";
27Ø PRINT@359,"6) SAVE AND EXIT
  ";
28Ø PRINT@48Ø,STRING$(31,"*");
29Ø POKE 1535,1Ø6
3ØØ T$=INKEY$:IF T$="" THEN 3ØØ
31Ø T=VAL(T$)
32Ø IF T<1 OR T>6 THEN 3ØØ
33Ø ON T GOSUB 42Ø,57Ø,34Ø,123Ø,
148Ø,39Ø
34Ø IF T=3 THEN GOSUB 8ØØ:GOSUB
89Ø    'INSERT
35Ø IF T=3 THEN PRINT"INSERT ANO
THER (Y/N)" ELSE 38Ø
36Ø U$=INKEY$:IF U$="" THEN 36Ø
37Ø IF U$="Y" THEN 34Ø
38Ø GOTO 18Ø
39Ø GOSUB 171Ø:GOTO 186Ø    'SAVE
 AND EXIT
4ØØ '
41Ø '
42Ø '*************************
43Ø '*   CREATE NEW FILE      *
44Ø '*************************
45Ø CLS:NUMBER=Ø
46Ø PRINT"ENTER NAMES AND BALANC
ES"
47Ø PRINT"TYPE 'XX' WHEN FINISHE
D"
48Ø LINE INPUT "NAME?";CUS$
49Ø IF CUS$="XX" THEN 53Ø
5ØØ INPUT "BALANCE";AMT
51Ø GOSUB 89Ø      'SEARCH AND IN
SERT
52Ø GOTO 48Ø       'GET NEXT RECO
RD
53Ø GOSUB 171Ø     'SAVE LIST
54Ø RETURN
55Ø '
56Ø '
57Ø '*************************
58Ø '*    READ IN FILE       *
59Ø '*************************
6ØØ CLS:IF DEVICE=1 THEN 65Ø
61Ø PRINT"REWIND TAPE TO START"
62Ø PRINT "PRESS PLAY ON RECORDE
R"
63Ø PRINT "PRESS <ENTER> WHEN RE
ADY"
64Ø Z$=INKEY$:IF Z$="" THEN 64Ø
65Ø OPEN "I",#DEVICE,"NAMES"
66Ø NUMBER=1:G=Ø
67Ø IF EOF(DEVICE) THEN 75Ø
68Ø INPUT #DEVICE,CUS$    'READ N
AME
69Ø INPUT #DEVICE,AMT     'READ B
ALANCE
7ØØ NAME$(NUMBER)=CUS$    'INSERT
 NAME
71Ø BALANCE(NUMBER)=AMT   'INSERT
 BALANCE
72Ø PTR(G)=NUMBER         'SET PO
INTER
73Ø NUMBER=NUMBER+1:G=G+1
74Ø GOTO 67Ø
75Ø CLOSE #DEVICE
76Ø NUMBER=NUMBER-1
77Ø RETURN
78Ø '
79Ø '
8ØØ '*************************
81Ø '*    GET CUSTOMER        *
82Ø '*************************
83Ø CLS
84Ø LINE INPUT "ENTER CUSTOMER N
AME: ";CUS$
85Ø INPUT "ENTER CUSTOMER BALANC
E";AMT
```


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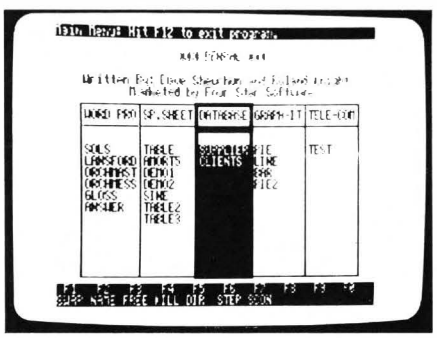

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```
86Ø RETURN
87Ø '
88Ø '
89Ø '*************************
9ØØ '*    SEARCH FOR INSERT   *
91Ø '*************************
92Ø P=Ø
93Ø TEMP=PTR(P)           'GET LI
NK
94Ø IF P=Ø THEN BACK=P    'FIRST
CELL IN LIST
95Ø IF (CUS$ < NAME$(TEMP)) OR (
PTR(P)=Ø) THEN GOSUB 1Ø1Ø:RETURN
   'IF FOUND THEN INSERT
96Ø BACK=PTR(P)
97Ø P=TEMP
98Ø GOTO 93Ø
99Ø '
1ØØØ '
1Ø1Ø '*************************
1Ø2Ø '*    INSERT CUSTOMER    *
1Ø3Ø '*************************
1Ø4Ø IF COUNT > Ø THEN 114Ø    'A
VAILABLE CELLS
1Ø5Ø NUMBER=NUMBER+1
1Ø6Ø NAME$(NUMBER)=CUS$:BALANCE(
NUMBER)=AMT      'INSERT NAME AND
 BALANCE
1Ø7Ø IF PTR(P)=Ø THEN 111Ø     'L
AST ELEMENT IN LIST
1Ø8Ø PTR(NUMBER)=PTR(P)        'P
OINT TO NEXT CELL
1Ø9Ø PTR(P)=NUMBER             'P
OINT TO NEW CELL
11ØØ RETURN
111Ø PTR(P)=NUMBER             'I
NSERT END OF LIST
112Ø PTR(NUMBER)=Ø
113Ø RETURN
114Ø DCELL=AVAIL(COUNT)        'G
ET AVAILABLE CELL
115Ø NAME$(DCELL)=CUS$         'I
NSERT NAME '
116Ø BALANCE(DCELL)=AMT        'I
NSERT BALANCE
117Ø PTR(DCELL)=TEMP           'P
OINT TO NEXT CELL
118Ø PTR(BACK)=DCELL           'P
OINT TO NEW CELL
119Ø COUNT=COUNT-1
12ØØ RETURN
121Ø '
122Ø '
123Ø '*************************
124Ø '*  SEARCH FOR DELETE     *
125Ø '*************************
126Ø CLS
127Ø LINE INPUT "NAME TO DELETE?
 ";DE$
128Ø P=Ø
129Ø IF NUMBER < 1 THEN RETURN
13ØØ TEMP=PTR(P)       'GET LINK
131Ø IF P=Ø THEN BACK=P
132Ø IF (PTR(TEMP)=Ø) AND (NAME$
(TEMP) <> DE$) THEN PRINT "SEARC
H FAILURE. "DE$" NOT IN LIST":FO
R CT=1 TO 1ØØØ:NEXT:RETURN
133Ø IF NAME$(TEMP)=DE$ THEN GOS
UB 139Ø:RETURN        'DELETE NAM
E
134Ø BACK=PTR(P)
135Ø P=TEMP
136Ø GOTO 13ØØ         'SEARCH NEX
T CELL
137Ø '
138Ø '
139Ø '*************************
14ØØ '*     DELETE CUSTOMER    *
141Ø '*************************
142Ø PTR(BACK)=PTR(TEMP)
    'POINT AROUND CELL
143Ø IF PTR(TEMP)=Ø THEN NUMBER=
NUMBER-1:RETURN        'LAST CELL
 IN LIST
144Ø COUNT=COUNT+1:AVAIL(COUNT)=
TEMP       'STORE POSITION OF CEL
L
145Ø RETURN
146Ø '
147Ø '
148Ø '*************************
149Ø '*       PRINT LIST       *
15ØØ '*************************
151Ø CLS:J=Ø:CT=Ø:TT=Ø:ST=Ø
152Ø IF HC$="Y" THEN PRINT#-2,"N
AME","","BALANCE"
153Ø IF HC$="Y" THEN PRINT#-2,CH
R$(11);:PRINT#-2,"____","","  ___
____":PRINT#-2
154Ø PRINT "NAME","BALANCE":PRIN
T
155Ø TEMP=PTR(J)
156Ø IF TEMP=Ø THEN 163Ø
157Ø ST=BALANCE(TEMP)
158Ø PRINT NAME$(TEMP),"";:PRINT
USING "$######.##";BALANCE(TEMP)
159Ø IF HC$="Y" THEN PRINT#-2,NA
ME$(TEMP),"","";:PRINT#-2,USING"
$######.##";BALANCE(TEMP)
16ØØ IF TEMP=Ø THEN 165Ø
161Ø CT=CT+1:TT=TT+ST
162Ø J=TEMP:GOTO 155Ø      'PRINT
 NEXT CELL
163Ø PRINT:PRINT "TOTAL CUSTOMER
S:";CT:PRINT"TOTAL BALANCE:";:PR
INT USING"$#######.##";TT
164Ø IF HC$="Y" THEN PRINT#-2:PR
INT#-2,"TOTAL CUSTOMERS:";CT:PRI
NT#-2,"TOTAL BALANCE:";:PRINT#-2
,USING"$#######.##";TT
165Ø PRINT:PRINT "PRESS ANY KEY
TO CONTINUE"
166Ø IF HC$="Y" THEN FOR T=1 TO
5:PRINT#-2:NEXT
167Ø K$=INKEY$:IF K$="" THEN 167
Ø
168Ø RETURN
169Ø '
17ØØ '
171Ø '*************************
172Ø '*       SAVE LIST        *
173Ø '*************************
174Ø IF DEVICE=1 THEN 178Ø
175Ø CLS:PRINT "PRESS PLAY AND R
ECORD"
176Ø PRINT "HIT ANY KEY WHEN REA
DY"
177Ø G$=INKEY$:IF G$="" THEN 177
Ø
178Ø J=Ø:OPEN "O",#DEVICE,"NAMES
"
179Ø TEMP=PTR(J)
18ØØ IF TEMP=Ø THEN 184Ø
181Ø PRINT #DEVICE,NAME$(TEMP)
182Ø PRINT #DEVICE,BALANCE(TEMP)

183Ø J=TEMP:GOTO 179Ø
184Ø CLOSE #DEVICE
185Ø RETURN
186Ø INPUT " CONFIRM EXIT (Y/N)"
;EX$
187Ø IF EX$="Y" THEN 188Ø ELSE I
F EX$="N" THEN 18Ø ELSE 186Ø
188Ø END
```


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See the Instant CoCo ad elsewhere in this issue.

Tame Your Reset Button

Control how your CoCo resets Basic programs.

You have probably heard of machine-language programs that will disable the break key. Now you can be the first on your block to tame your CoCo's reset button.

Listing 1 is a short Assembly program that redirects the normal restart routines so that when you press the reset button, the program starts at any line number desired. To achieve a flexible start, the reset sequence (described on p. 208 of *Going Ahead with Extended Color Basic)* is modified.

Here's what the reset button does. First, it resets most of the CoCo's main circuits to a clear condition. This means that your CoCo gets amnesia. Second, it synchronizes the video chip (VDG) at random to the leading or trailing edge of the main clock's square wave. In short, the artifact colors of PMODE4 change. Third, the master chip (6809E) does an automatic restart (JMP [$FFFE]), which for the CoCo means start at $A027 in the Color Basic ROM. Fourth, either the text screen appears with "OK" or the copyright message appears with "OK".

Program Listing 2 illustrates how you can make your CoCo restart at any line of your program automatically on release of the reset button. Listing 2 restarts at three different locations depending on when the reset button is pushed. Note that the first use of the reset button simulates the start of Radio Shack's Sands of Egypt, where the artifact colors are selected.

Listing 1 works with the Color Basic 1.0 or 1.1, Extended Color Basic 1.0, and Disk Color Basic 1.0 ROMs. If you have the disk Basic 1.1 ROM, see the comment in line 460 for the necessary changes. If you do not have Extended Color Basic, the program assumes that you will not be using PMODE graphics. You can add a section of code at the indicated spot to directly set the SAM chip.

To keep the program as short as possible, undocumented ROM routines are used. I will describe what these routines do and include below the first few commands in each so you can find them in your version of ROM if they have been relocated:

Locations $72–73 are a warm-start reset vector CB $A0E8; EXCB $80C0; DCB $C0D4

```
0A0E8/ NOP
080C0/ NOP
0C0D4/ NOP
0A0E9/ CLR <6F
080C1/ CLR <0E3
0C0D5/ BSR 0C0DD
0A0EB/ JSR >0AD33
080C3/ CLR <0E4
0C0D7/ JSR >0D1E5
0A0EE/ ANDCC #0AF
080C5/LDA >0FF03
0C0DA/JMP >080C0
```

The vector at $183 is called before each keyboard input = RTS.

$AD03 converts the hex line number in register D to line location plus one in locations $47–48.

```
0AD03/ LDX <19
0AD05/ LDU ,X
0AD07/ BEQ 0AD12
0AD09/ CMPD 2,X
```

$95CF executes the SCREEN1,n command using the last value given. This is part of Extended Color Basic. You can set $FF22 and $FFC0–$FFD3 directly.

```
095CF/ PSHS X,B,A
095D1/ LDA <0B6
095D3/ ADDA #3
095D5/ LDB #10
```

$ADA7 executes the line at the location in register X.

```
0ADA7/ STX <2F
0ADA9/ LDA ,X+
0ADAB/ BEQ 0ADB4
0ADAD/ CMPA #3A
0ADAF/ BEQ 0ADC0
0ADB1/ JMP >0B277
```

Listing 1 is position independent so it can be located anywhere convenient. Note, however, that the vectors at $72 and $183 must be reset either manually with POKEs or by reassembling the listing. Further, you must keep track of the locations of variables LNNUM and FLAG2 since your Basic program must communicate with them.

Listing 2 is shown used with a tape system, but the machine-language routines can be LOADMed from disk or POKEd from data. Line 1 is a subroutine that loads the machine-language variables LNNUM and FLAG2. It should be called before a new start line is required. The Basic variables LN and SC are converted into the machine-language variables LNNUM and FLAG2. Thus, LN should be made equal to the line to which the reset button should branch. To obtain a text screen make SC = 0; to obtain a graphic screen make SC = 1. Listing 2 assumes the presence of Extended Color Basic. Those of you with only Color Basic should replace the graphics commands with something else.

A few precautions are advisable. Do not point LNNUM into a FOR...NEXT loop or toward a RETURN as Basic's stack has been reset and an error will result. Do not point into a graphics routine in progress unless you are sure of the results. Not only may the artifact colors change, but other problems occur as well. As an example, don't try to rePAINT something already painted the desired color. Be careful of mixed graphic modes as they can be canceled.

If the above has not stimulated your imagination, consider that only minor adjustments are needed for the following applications: auto-restart of programs at any line number; auto-restart after an error; implementation of anti-theft schemes; prevention or loss of the all-RAM (64K) mode. ■

System Requirements

16K RAM
Color Basic (Without Graphics)
Extended Color Basic
(With Graphics)
Editor/Assembler

Address correspondence to Robert Gault, 832 N. Renaud, Grosse Point Woods, MI 48236.

Program Listing 1. Reset Button Tamer

```
                        00100 *TAME YOUR RESET BUTTON
                        00110 *BY ROBERT GAULT 2/2/85
                        00120 *
                        00130 *
                        00140 *
                        00150 *CHANGE WARM START VECTOR
0072                    00160          ORG $72
0072        7F06        00170          FDB RESET
                        00180 *START OF NEW ROUTINES
                        00190 *PLACE TO SUIT BUT BE
                        00200 *SURE TO CLEAR M.L. SPACE
                        00210 *IN BASIC PROGRAM
7F00                    00220          ORG $7F00
7F00                    00230 LNNUM    RMB 2 LINE NUMBER
7F02        00          00240 FLAG2    FCB 0    GRAPHICS
7F03                    00250 LNLOC    RMB 2 LINE LOCAL
7F05        00          00260 FLAG     FCB 0    RESET
                        00270 *NEW WARM START VECTOR
7F06 12                 00280 RESET    NOP *MUST BE HERE
7F07 EC     8C F6       00290          LDD LNNUM,PCR
7F0A BD     AD03        00300          JSR $AD03   FIND
7F0D 25     0B          00310          BCS VECTOR   LOC
7F0F 63     8C F3       00320          COM FLAG,PCR
7F12 DC     47          00330          LDD $47 LN LOC+1
7F14 83     0001        00340          SUBD #1
7F17 ED     8C E9       00350          STD LNLOC,PCR
                        00360 *$C0D4 FOR DISK 1.0
                        00370 *$80C0 FOR EX.BASIC 1.0
                        00380 *$A0E8 FOR BASIC 1.1
                        00390 *CHECK YOUR OWN SYSTEM
                        00400    *
                        00410    *
                        00420    *
7F1A CC     444B        00430 VECTOR   LDD #$444B DK
7F1D 10B3 C000          00440          CMPD $C000
7F21 26     03          00450          BNE V1
7F23 7E     C0D4        00460          JMP $C0D4       **CHANGE TO C0E7 FOR DISK ROM1.1
7F26 CC     4558        00470 V1       LDD #$4558 EX
7F29 10B3 8000          00480          CMPD $8000
7F2D 26     03          00490          BNE V2
7F2F 7E     80C0        00500          JMP $80C0
7F32 7E     A0E8        00510 V2       JMP $A0E8 PLAIN
                        00520    *
                        00530    *
                        00540    *
                        00550 *NEW GET INPUT VECTOR
7F35 34     01          00560 RESTRT   PSHS CC
7F37 6D     8C CB       00570          TST FLAG,PCR
7F3A 27     1E          00580          BEQ EXIT
7F3C 35     01          00590          PULS CC
                        00600 *CLEAR RESTART CALL
7F3E 6F     8C C4       00610          CLR FLAG,PCR
                        00620 *TEST FOR TEXT OR GRAHPIC
7F41 6D     8C BE       00630          TST FLAG2,PCR
7F44 27     0C          00640          BEQ TEXT
                        00650 *TEST FOR EX.COLOR BASIC
7F46 CC     4558        00660          LDD #$4558
7F49 10B3 8000          00670          CMPD $8000
7F4D 26     03          00680          BNE TEXT
                        00690    *PMODE SCREEN CALL TO
                        00700    *EX. COLOR BASIC 1.0
7F4F BD     95CF        00710          JSR $95CF
                        00720 *LOAD RESTART LINE IN X
                        00730    *
                        00740    *
7F52 AE     8C AE       00750 TEXT     LDX LNLOC,PCR
                        00760    *
                        00770    *
                        00780 *INDICATE DIRECT
                        00790 *COMMAND
7F55 1C     AF          00800          ANDCC #$AF
                        00810 *EXECUTE LINE
7F57 7E     ADA7        00820          JMP $ADA7
7F5A 35     81          00830 EXIT     PULS CC,PC
                        00840 *CHANGE INPUT  FROM
                        00850 *KEYBOARD VECTOR
0182                    00860          ORG $182
0182        7E          00870          FCB $7E
0183        7F35        00880          FDB RESTRT
            0000        00890          END
00000 TOTAL ERRORS
```

Program Listing 2. Sample Basic Program. Note the LN and SC variables in lines 2, 10, and 15.

```
0 CLS:CLEAR200,&H7F00:CLOADM"RES
ET":GOTO2
1 POKE&H7F00,LN/256:POKE&H7F01,L
N-256*INT(LN/256):POKE&H7F02,SC:
RETURN
2 LN=4:SC=1:GOSUB1:CLS:PRINT"TUR
N OFF TAPE RECORDER":PRINT"PUSH
THE RESET BUTTON AT ANY     TIME
DURING THIS PROGRAM AND     WATCH
 WHAT HAPPENS.":PRINT:PRINT"HIT
ANY KEY"
3 IFINKEY$=""THEN3
4 PMODE4,1:PCLS1:SCREEN1,1:PMODE
3
5 COLOR2,1:LINE(120,90)-(130,100
),PSET,BF
6 LN=7:SC=0:GOSUB1
7 PMODE4,1:CLS5:PRINT@168,"IF RE
D  PUSH reset";:PRINT@200,"IF BL
UE PUSH ENTER";
8 FORT=1TO160:NEXT:IFINKEY$=CHR$
(13)THEN10
9 SCREEN1,1:FORT=1TO160:NEXT:SCR
EEN0,0:IFINKEY$=CHR$(13)THEN100EL
SE8
10 LN=11:SC=1:GOSUB1
11 PMODE4,1:PCLS:SCREEN1,1:PMODE
3,1
12 CIRCLE(128,96),96,4,.8:CIRCLE
(90,70),9,4:CIRCLE(166,70),9,4
13 PAINT(128,96),2,4:PAINT(90,70
),4,4:PAINT(166,70),4,4
14 CIRCLE(128,110),70,3,.4,.05,.
45:CIRCLE(128,145),10,3,1.5,.9,.
65:PAINT(128,145),3,3
15 PMODE4,1:LN=16:SC=1:GOSUB1
16 IFINKEY$=""THEN16
17 CLS:PRINT"PUSH THE RESET BUTT
ON
                                END
```


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Personalized Programs

If you have several short educational programs that a student will run in succession, you can add a personal touch. Incorporate Listing 1 into the first program the student will use, placing it at the beginning of that program. The computer asks for the user's name and POKEs it into high memory, where it will be unaffected by other programs that are loaded from tape or disk. Place Listing 2 at the beginning of subsequent programs. Before each new program begins, it welcomes the student by bringing his name back from protected storage.

The program is written for a 32K machine and will run under Color Basic or Extended Color Basic. To use it with 16K machines, change all occurrences of 32700 in Listings 1 and 2 to 16316. If any of the programs you run contains a machine-language subroutine that is stored above memory location 32700, adjust the storage area for the Listings. Line 10 in Listing 1 clears 200 bytes; increase this value if you need more storage space.

True/False Test Generator

How often have you wanted to create a true/false test quickly? Have you ever wished you could scramble the order of the questions to make cheating more difficult for students with roving eyes? If you have a 16K CoCo with Extended Color Basic and an 80-column printer, True/False Generator (Listing 3) can help you. Unfortunately, you still have to come up with the questions.

The program stores your questions in a bank of DATA lines. The generator types out as many different arrangements of the test as you need, prevents the printer from splitting a word at the end of the line, and even lets you print answer keys. You can have the computer print a test using all the questions or create a test with fewer questions. The program shuffles the questions and ensures that each question appears only once per test.

Modifying the program to suit your grade level and subject is easy. As you add DATA lines, increase the value of string space cleared (200) in line 10. If you do not add adequate space, an OS error occurs. Set the variable NN (also in line 10) to equal the number of test questions plus one. If you have 25 questions, for example, NN should equal 26.

The program installs your questions in the DATA statements numbered from 1010 up to 10000. The proper format is:

Line Number DATA Question., Answer

State each question as a sentence and include a period. Use a comma between the question and the answer, which will be either T or F. Be sure that the last DATA line reads:

Line Number DATA END,E

Figures 1 and 2 show printouts of student and teacher versions of a chemistry test. Can you imagine making a test that neat with a typewriter or creating different arrangements of the questions using that dreaded machine? ■

```
                    CHEMISTRY '85

(  )  1) TWO ELEMENTS COMBINE TO FORM A COMPOUND. THE SYMBOL FOR THE ELEMENT
         WHICH IS OXIDIZED IS ALWAYS PLACED ON THE LEFT IN THE COMPOUND'S
         FORMULA.
(  )  2) SODIUM'S SYMBOL IS Na.
(  )  3) OZONE IS TRIATOMIC OXYGEN.
(  )  4) THE NONMETALS ARE LOCATED ON THE LEFT SIDE OF THE PERIODIC TABLE OF THE
         ELEMENTS.
(  )  5) THERE ARE TWO OXYGEN ATOMS IN A HYDROXIDE ION.
(  )  6) A SOLUTION WITH A PH OF 3 IS BASIC.
(  )  7) THE OXIDATION NUMBER FOR SULFATE IS -2.
(  )  8) KINETIC ENERGY IS ENERGY DUE TO AN OBJECT'S MOTION.
(  )  9) FERROUS IS THE IRON ION WITH AN OXIDATION NUMBER OF +2.
(  )  10) THE SYMBOL FOR GOLD IS G.
```

Fig. 1. Student's Chemistry Test

```
                    CHEMISTRY '85

(T)  1) TWO ELEMENTS COMBINE TO FORM A COMPOUND. THE SYMBOL FOR THE ELEMENT
         WHICH IS OXIDIZED IS ALWAYS PLACED ON THE LEFT IN THE COMPOUND'S
         FORMULA.
(T)  2) SODIUM'S SYMBOL IS Na.
(T)  3) OZONE IS TRIATOMIC OXYGEN.
(F)  4) THE NONMETALS ARE LOCATED ON THE LEFT SIDE OF THE PERIODIC TABLE OF THE
         ELEMENTS.
(F)  5) THERE ARE TWO OXYGEN ATOMS IN A HYDROXIDE ION.
(F)  6) A SOLUTION WITH A PH OF 3 IS BASIC.
(T)  7) THE OXIDATION NUMBER FOR SULFATE IS -2.
(T)  8) KINETIC ENERGY IS ENERGY DUE TO AN OBJECT'S MOTION.
(T)  9) FERROUS IS THE IRON ION WITH AN OXIDATION NUMBER OF +2.
(F)  10) THE SYMBOL FOR GOLD IS G.
```

Fig. 2. Teacher's Chemistry Test and Answer Key

System Requirements

16K
Extended Color Basic

Address correspondence to James Wood at 424 N. Missouri, Box 507, Atwood, IL 61913.

Program Listing 1. Name Program that Resides in High Memory

```
1Ø CLEAR2ØØ,327ØØ
2Ø CLS:INPUT"WHAT IS YOUR NAME";
NA$
3Ø L=LEN(NA$):IF L>67 THEN PRINT
"NEED A SHORTER NAME":GOTO2Ø
4Ø POKE327ØØ,L
5Ø FOR A=1 TO L
6Ø B=ASC(MID$(NA$,A,1))
7Ø POKE A+327ØØ,B:NEXTA
8Ø REMARK PROGRAM STARTS HERE
```

Program Listing 2. Welcome-Back Program

```
1Ø CLS:L=PEEK(327ØØ)
2Ø PRINT"WELCOME BACK,"
3Ø FOR A=1 TO L
4Ø NA$=NA$+CHR$(PEEK(A+327ØØ)):N
EXTA:PRINTNA$
5Ø REMARK FOLLOWING PROGRAMS STA
RT HERE
```

Program Listing 3. True/False Test Generator

```
1Ø CLEAR2ØØ:PCLEAR1:NN=13
2Ø CLS:PRINT"TRUE-FALSE TEST GEN
ERATOR"
3Ø INPUT"TITLE";T$
4Ø DIM Q$(NN),A$(NN),S(NN),JW(NN
):N=1
5Ø READ Q$(N),A$(N)
6Ø IF Q$(N)="END" THEN 68 ELSE N
=N+1:GOTO5Ø
68 N=N-1
7Ø PRINT:PRINT"THERE ARE";N;"QUE
STIONS.":PRINT"HOW MANY ARE TO B
E ON THE TEST":INPUT NQ:IF NQ>N
THEN 7Ø
8Ø PRINT:PRINT"PRINTER SHOULD BE
 CONNECTED,":PRINT"AND TURNED ON
 BEFORE HITTING":PRINT"    (ENTE
R)"
9Ø INPUT IO
1ØØ PRINT#-2,STRING$(4Ø-LEN(T$)/
2,32);T$:PRINT#-2,""
11Ø FOR A=1 TO NQ
12Ø R=RND(N):IF JW(R)=1 THEN 12Ø
 ELSE JW(R)=1
13Ø S(A)=R
14Ø PRINT#-2,"( ) ";STR$(A);") "
;:TL$=Q$(R)
15Ø L=LEN(TL$):IF L<73 THEN PRIN
T#-2,TL$:GOTO18Ø
16Ø FOR G=72 TO 3Ø STEP-1:IF MID
$(TL$,G,1)=" " THEN 17Ø ELSE NEX
T G
17Ø PRINT#-2,LEFT$(TL$,G-1):TL$=
RIGHT$(TL$,L-G):PRINT#-2,STRING$
(8,32);:GOTO15Ø
18Ø NEXT A
19Ø FORA=1TO1Ø:PRINT#-2,"":NEXT
2ØØ PRINT#-2,STRING$(4Ø-LEN(T$)/
2,32);T$:PRINT#-2,""
21Ø FORA=1TO NQ
22Ø PRINT#-2,"(";A$(S(A));") ";S
TR$(A);") ";:TL$=Q$(S(A))
23Ø L=LEN(TL$):IF L<73 THEN PRIN
T#-2,TL$:GOTO26Ø
24Ø FOR G=72 TO 3Ø STEP-1:IF MID
$(TL$,G,1)=" " THEN 25Ø ELSE NEX
T G
25Ø PRINT#-2,LEFT$(TL$,G-1):TL$=
RIGHT$(TL$,L-G):PRINT#-2,STRING$
(8,32);:GOTO23Ø
26Ø NEXTA
27Ø END
1Ø1Ø DATA THE SYMBOL FOR GOLD IS
 G.,F
1Ø2Ø DATA WATER HAS THREE ELEMEN
TS IN ITS FORMULA.,F
1Ø3Ø DATA KINETIC ENERGY IS ENER
GY DUE TO AN OBJECT'S MOTION.,T
1Ø4Ø DATA TWO ELEMENTS COMBINE T
O FORM A COMPOUND. THE SYMBOL FO
R THE ELEMENT WHICH IS OXIDIZED
IS ALWAYS PLACED ON THE LEFT IN
THE COMPOUND'S FORMULA.,T
1Ø5Ø DATA THE OXIDATION NUMBER F
OR SULFATE IS -2.,T
1Ø6Ø DATA THERE ARE TWO OXYGEN A
TOMS IN A HYDROXIDE ION.,F
1Ø7Ø DATA OZONE IS TRIATOMIC OXY
GEN.,T
1Ø8Ø DATA PH PAPER IS BLUE IN A
BASIC SOLUTION.,T
1Ø9Ø DATA A SOLUTION WITH A PH O
F 3 IS BASIC.,F
11ØØ DATA FERROUS IS THE IRON IO
N WITH AN OXIDATION NUMBER OF +2
.,T
111Ø DATA THE NONMETALS ARE LOCA
TED ON THE LEFT SIDE OF THE PERI
ODIC TABLE OF THE ELEMENTS.,F
112Ø DATA SODIUM'S SYMBOL IS Na.
,T
1ØØØØ DATA END,E
```


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6809 on Line

by Bobby Ballard

BBS Hardware

In September I presented an overview of setting up a BBS, discussing time commitment, audience, and services. But there's more to running a BBS; you must think about necessary hardware and its cost. Starting with the basics, let's look at equipment you might consider.

Software Influences Hardware

Your choice of software greatly affects the hardware you need. There are a number of options, the most inexpensive of which is to write your own programs. If you have the talent for writing machine-language, you can write a driver program to control the serial port through modifications to Basic and stand-alone subroutines. Or you can purchase a driver, like Remoterm from Star-Kits Inc. or 232 RemotePlus from EDC Inc. In either case, you will need to write the remaining program or programs in Basic. The advantage to this approach is obvious: Because you design the system, your hardware choices are not restricted.

Purchased software offers different advantages. One commercial package, Colorama, is thoroughly supported by the manufacturer, Ceratec. You get quick and courteous help if you have problems. Purchased software is well worth the price, especially if you have limited programming time or talent. However, you still need a working knowledge of Basic to run a commercial BBS because you must be able to make program modifications and system adjustments to set up your board.

Knowledge of RS-232 protocols is also important. You need a special cable to accommodate the additional RS-232 lines missing on the CoCo. Colorama uses the standard I/O, cassette, and joystick ports on the back of the CoCo to deal with 1,200-baud detection, carrier-detect, and smart-modem features. A CoCo, drives, controller, and autoanswer modem are the basic requirements for a Colorama system—you won't need an RS-232 port or Multi-Pak Interface. The system will handle up to three double-sided drives but can be run on one single-sided drive, as well.

The middle ground between purchased and original software is public-domain software. The cost is low, but you must be willing to debug and modify the programs. Even if you make a donation, you do not get the same support you receive when you buy a commercial package.

One such program, COBBS, written by Richard Duncan, can be downloaded from CompuServe or another BBS. At present, COBBS supports up to three single-sided drives and requires Tandy's Deluxe RS-232 Program Pak (catalog no. 26-2226). You must therefore use a Multi-Pak Interface (catalog no. 26-3124) or a Y cable, but your serial I/O port is free for a printer or another peripheral. In addition, using a fully configured RS-232 port gives you greater control over your modem and its control lines.

Since the CoCo lacks a standard RS-232 port, you cannot reliably send data at speeds above 1,200 baud using the existing port. With the advent of 2,400 baud, you might want to consider adding an RS-232 port. Of course, this requires that you purchase a Multi-Pack Interface to simultaneously handle your drive and controller. You might buy Tandy equipment or purchase a bus-expansion board from PBJ Inc.

A BBS Ties Up Equipment

An early decision you must make is whether to have an additional phone line installed. If your board will be on line 24 hours a day, consider dedicating a separate phone line for your BBS. BBS numbers get passed on and often the information regarding hours of operation is omitted. You might find people calling you at all hours, thinking it is a 24-hour-a-day board.

Equally important is balancing your personal computing and BBS needs. You might not be able to get by if you have only one CoCo with a drive controller and two disk drives. When your BBS is running, your CoCo will be tied up just as if someone else were at the keyboard. Setting up a separate system is expensive. Adding a printer might prove invaluable in printing membership lists and tracking caller activity while you are away from the terminal, but it will increase costs, too.

Then there's OS-9. Perhaps you can use it to time-share and multitask in order to accommodate your personal and BBS needs. But while it is possible to run a system on OS-9, only one person can access the disk system at a time. OS-9 is still worth considering, though, because you might be able to serve two callers at once using a dual RS-232 port from PBJ Inc.

Another important piece of BBS equipment is a modem. If you don't own an autoanswer modem, you will need one for your BBS. Even if you do, you must choose between tying it up with the BBS or buying a second one. Of course, if you telecommunicate only occasionally, you might not need two modems.

Other Considerations

Storage capacity is the heart of any BBS and represents the largest overall cost. You need disk space for all files and storage space for the disks. Uploading and downloading also consume space. In fact, most download and information files are stored in ASCII, which uses more space than tokenized Basic. A program that uses 5 granules in Basic might use 6–8 granules in ASCII.

Protecting files from spikes and surges must be figured in total costs. With a BBS it is best to protect the telephone lines in addition to the system power lines.

There are many odds and ends that also add up. Paper and printer ribbons are two of the little things that you'll need more of once your BBS goes on line. It's clear that there are many factors to consider and many places to spend money, but you are the controlling factor. What you want from the BBS and how it is run are up to you. ■

Address correspondence to Bobby Ballard, 1207 Eighth Ave., 4 R, Brooklyn, NY 11215. You can also reach him on line through CompuServe (#72746,2373 or #73135,255), The Source (#BCT173), and MCI Mail (#172-3476). Bobby's BBS number is 718-499-1633.

Manufacturers

CompuServe
P.O. Box 20212
Columbus, OH 43220
800-848-8990

Ceratec Inc.
P.O. Box 663
Elgin, TX 78621
512-285-2620

Richard Duncan
2504 North Gathings Drive
W. Memphis, AR 72301
BBS Number: 501-735-5614

EDC Inc.
P.O. Box 42718
Los Angeles, CA 90042
213-254-6809
BBS Number: 213-258-0640

PBJ Inc.
P.O. Box 813
North Bergen, NJ 07047
201-330-1898

Star Kits Inc.
P.O. Box 209
Mt. Kisco, NY 10549
914-241-0287

Tandy
1400 One Tandy Center
Fort Worth, TX 76102

Reader's Forum

INKEY$ Improvement

The article, "Those Amazing POKEs" (*HOT CoCo*, March 1985, p. 28) was very interesting, but I needed something more. My one-liner combines the best qualities of INKEY$ and EXEC44539:

```
0 X$ = " ":POKE VARPTR(X$) + 2,0:POKE VARPTR(X$) + 3,&H87
```

After a program executes this line, X$ will contain the value of the last key pressed after any use of INKEY$ or EXEC44539.

Because this line changes the string pointer for X$ to the last-key-pressed memory location in the Basic communications area, you should not use X$ for another value or you might write over important data. If you are already using X$ as a variable, substitute another single-character variable, making sure that both POKEs use the correct VARPTRs.

Geoffery H. Frizzell
Edmonton, Alberta

Pseudo PRINT USING

If you're using an MC-10 or a CoCo without Extended Color Basic (or even an Apple II or Commodore), you can't take advantage of Basic's PRINT USING statement. This command is particularly useful when you are working with numbers or money amounts because it lets you round off numbers or display figures in columns with the decimal points aligned. For example, the statement, PRINT USING "####.##";7634.728, will print the number as 7634.73.

While you can't change your computer's command vocabulary, you can use my short utility as a substitute for PRINT USING. Lines 10–240 and 360 are included for demonstration purposes; they show how the numbers can be printed. Lines 210–350 contain the pseudo PRINT USING subroutine. Before the main program branches to it, you need to assign the number of places before the decimal (NB), the number of places after the decimal (NA), and the number that you want converted (N). Upon returning control to the main program, you must include a line that prints N$. The number will be printed as if you had used PRINT USING.

```
10 CLS:'ANN REEVES
20 PRINT @8,"PROGRAM TO SIMULATE ":PRINT"PRINT USING "CHR$(34)"########.##"CHR$(34):PRINT"  (I.E. WRITE NUMBERS IN COLUMNS AND ROUNDED A SPECIFIC NUMBER  OF PLACES)"
30 INPUT"<ENTER> FOR DEMONSTRATION";A$
40 CLS:PRINT"THE NUMBERS - AS THEY ORIGINALLY WERE
50 FOR X=1 TO 10:READ Y:PRINT Y:NEXT X:RESTORE
60 INPUT"<ENTER>";A$
70 ''''
80 CLS:PRINT"IN A COLUMN - ROUNDED TO NEAREST INTEGER (COLUMN WIDTH 7)
90 PRINT"LIKE PRINT USING"CHR$(34)"#######"CHR$(34)",N"
100 NA=0:NB=7 'SET 7 PLACES BEFORE DECIMAL, 0 PLACES AFTER DECIMAL
110 FOR X=1 TO 10:READ Y:N=Y:GOSUB220
120 PRINT N$:NEXT X:RESTORE
130 INPUT"<ENTER>";A$
140 ''''
150 CLS:PRINT"IN A COLUMN - ROUNDED TO NEAREST CENT (HUNDREDTH)--6 PLACES    BEFORE THE DECIMAL, 2 PLACES    AFTER THE DECIMAL
160 PRINT"LIKE PRINT USING"CHR$(34)"######.##"CHR$(34)",N
170 NA=2:NB=6 'SET 6 PLACES BEFORE DECIMAL, 2 PLACES AFTER DECIMAL
180 FOR X=1 TO 10:READ Y:N=Y:GOSUB220
190 PRINT N$:NEXT X
200 END
210 '''THIS SUBROUTINE USES VARIABLES N$,N,NA,NB,NC,NL,NT
220 IF N>-.01AND N<.01 THEN N=0
230 IF NA>0 THEN NT=NA+NB+1 ELSE NT=NB
240 IF N>999999999 OR N<-999999999 THEN PRINT "OUT OF RANGE";:N$=STR$(N):RETURN  ''JUST IN CASE THE NUMBER IS TOO BIG
250 N=(INT(10^NA*N+.5))/10^NA
260 N$=STR$(N)
270 FOR NL=1 TO LEN(N$)
280 IF MID$(N$,NL,1)="." THEN GOTO 340
290 NEXT NL
300 IF NA>0THEN N$=N$+".":FOR NC=1 TO NA:N$=N$+CHR$(48):NEXT NC
310 IF LEN(N$)>NT+1 THEN NT=LEN(N$) 'JUST IN CASE THE NUMBER WAS TOO LONG
320 FOR NC=1 TO NT:N$=CHR$(32)+N$:NEXT NC
330 N$=RIGHT$(N$,NT):RETURN
340 IF NA>0 THEN FOR NC=1 TO NA:N$=N$+CHR$(48):NEXT NC
350 N$=LEFT$(N$,NL+NA):GOTO310
360 DATA 1298.799,234.3218,549999,34.2,6547.4321,8.0893,654.987,.1765,54.654,345421.553
```

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Assembly 101

by Victor and James Perotti

The Nondestructive Cursor

To follow this column, you will need an editor/assembler. The authors use Micro Work's Macro-80C disk assembler, and changes are given for Radio Shack's EDTASM+. Other assemblers will also work, but the programs may require some additional modification. The documentation that comes with your software should provide the commands you need.

Last month's program, Destructive Cursor, let you use the arrow keys to move the cursor around the screen, wiping out whatever letters were printed under the new cursor location. Actually, the cursor is printed on the screen. POLCAT writes a blank ($60) at the cursor address; hence, when the cursor moves again, a blank remains where the cursor had been. To manipulate text, you also need the option of a nondestructive cursor—one that you can move without destroying existing characters.

The cursor is inherently destructive; you cannot prevent the computer from writing the cursor ($60) at the address in $88 when POLCAT is used in a program. You don't want to completely abandon POLCAT, but you do want a way to save the character that the cursor would otherwise destroy. To do this, you must restore the character to its original position after the cursor moves, so you must also store the address for the character saved.

However, you don't always want to restore the original character. If POLCAT is called to write a new character at the cursor's location, the new character should take the place of the old. On the other hand, if you're just moving the cursor through a screen address, you'll want the original character restored.

The whole thing sounds complicated. The hard part about writing more complex programs is figuring out what the program must do and how it should accomplish that task. Break the problem down into single parts; then write code to perform each part. We'll leave the lecture on flowcharting and pseudocodes to more advanced Assembly-language classes, but you should get the logic down before you fire up the editor and begin writing code.

The following steps will give you a nondestructive cursor:

- Go to POLCAT. Is the next key pressed an arrow key or a regular ASCII character?
- If it is an ASCII character, print it, update register X, save the character at the new X, and update the cursor.
- If the key pressed is an arrow key, determine where the cursor will go (use the updated address in X); check to see if the address is still on the screen (i.e., greater than $400 and less than $5FF); save the character at the location to which the cursor is moving; restore the saved character that was at the cursor's original location; and move the cursor to the new location.
- Return to POLCAT.

There are lots of ways to set up a temporary storage location for characters you want to save. Both Macro-80C and EDTASM+ have a pseudo-operating instruction for creating storage location in RAM: The acronym is RMB, Reserve Memory Byte. The number of bytes of memory to be reserved for this use follows RMB. For example, CHAR RMB 1 sets up a 1-byte storage location for the character. The assembler automatically assigns the memory location to CHAR.

The Program Listing, Nondestructive Cursor, displays the longer GO routine, which now has the following four routines:

- Jump to the POLCAT subroutine to scan the keyboard, and jump to DONE if the break key was pressed.
- Branch to the subroutines if one of the arrow keys was pressed.
- Display the character and update the cursor.
- Save the character at the next position.

If you're using EDTASM+, change line 0007 to ORG $1200, delete line 0008, and move the START instruction down to line 0009. Change line 0058 to DONE SWI.

The SAVE routine is new. After X is incremented, the new address is stored in the cursor pointer and is also used to save the character at X. Although B holds the ASCII value, the program also stores B in the CHAR location in RAM. The program then loops back to GO to scan the keyboard again. If POLCAT picks up another ASCII character, the character is written to X and the content of CHAR is ignored.

System Requirements

16K
Color Basic
Editor/Assembler

Restoring the Old Character

If POLCAT's keyboard scan finds that an arrow key was pressed, it is best to use the old X address (before it is altered in the arrow-key subroutine) to restore the character that the cursor displaced. The RSTORE subroutine moves the contents of CHAR into A; A is then stored or printed at X. Note that each of the arrow-key subroutines begins with a JSR (Jump to the Subroutine) RSTORE. Note also that JSR subroutines must end with an RTS (Return to Subroutine), which concludes the subroutine and returns control to the calling routine. Now the X address and CURSOR can be updated to reflect the arrow key that the original subroutine called.

But you're not done yet. Before you can include a branch back to GO, which will print the cursor at the new position, the character in the new location needs to be stored in CHAR. You can use the arrow keys to run the cursor off the screen, so the program must check the cursor location to see if X is between $400 and $5FF. If the address is OFFTOP or OFFBOT, the program will place the cursor at the first or last position on the screen. However, as before, you must store the character occupying that first or last spot for later use. But that's easy: Use the SAVE subroutine again, and then BRA GO. ■

Write to James and Victor Perotti at 163-Pine Grove Heights, Athens, OH 45701.

Program Listing. Nondestructive Cursor

```
                        ********************************
                        *   NON DESTRUCTIVE CURSOR     *
                        ********************************
                        *
                        ** DEFINE SYMBOLS FOR ROM CALLS
                        *
0001 0E00               CHAR    RMB 1           BYTE TO HOLD OLD CHARACTER
0002 0400               VIDRAM EQU $0400        TOP OF SCREEN ADDR
0003 A1B1               POLCAT EQU $A1B1        GET CHAR FROM KEYBOARD
0004 A30A               PRINT  EQU $A30A        PRINT CHARACTER TO SCREEN
0005 0088               CURSOR EQU $088         ADDRESS FOR CURSOR
0006 A928               CLS    EQU $A928        SUBROUTINE TO CLEAR SCREEN
0007 A027               BASIC  EQU $A027        ROM ADDR FOR BASIC
0008 0E01               START  NAM NONCUR
0009 0E01 BDA928               JSR CLS          CLEAR SCREEN
0010 0E04 8E0400        TOP    LDX #VIDRAM
0011 0E07 9F88                 STX CURSOR       PUT CURSOR AT TOP OF SCREEN
```

```
0012 0E09 BDA1B1    GO      JSR POLCAT      CHECK KEYBOARD
0013 0E0C 8103              CMPA #03        IS IT THE BREAK KEY?
0014 0E0E 2764              BEQ DONE        RETURN TO BASIC

                    ******IS THE KEY AN ARROW KEY?

0015 0E10 8109              CMPA #09        IS IT RIGHT ARROW?
0016 0E12 2727              BEQ RIGHT
0017 0E14 8108              CMPA #08        IS IT LEFT ARROW?
0018 0E16 271C              BEQ LEFT
0019 0E18 810A              CMPA #10        IS IT DOWN ARROW?
0020 0E1A 272E              BEQ DOWN
0021 0E1C 815E              CMPA #94        IS IT UP ARROW?
0022 0E1E 2722              BEQ UP

                    *****MUST BE REGULAR CHARACTER
                    **PRINT IT, SAVE OLD CHARACTER


0023 0E20 BDA30A    CHROUT JSR PRINT        DISP CHAR ON SCREEN
0024 0E23 3001              LEAX 1,X        INCREMENT CURSOR
0025 0E25 9F88              STX CURSOR
                    *
                    **NOW SAVE CHR IN NEW LOCATION
                    *
0026 0E27 E684      SAVE    LDB ,X          GET OLD CHAR
0027 0E29 F70E00            STB CHAR        SAVE OLD CHARACTER
0028 0E2C 20DB              BRA GO          GET ANOTHER CHARACTER

                    ********************************
                    **SUBROUTINE FOR:
                    *****  RESTORING OLD CHARACTER
                    ********************************

0029 0E2E B60E00    RSTORE LDA CHAR         GET OLD CHR
0030 0E31 A784              STA ,X          DISP IT AT OLD SPOT
0031 0E33 39                RTS             RETURN TO SUBROUTINE CALL

                    *****SUBROUTINES FOR EACH ARROW

0032 0E34 BD0E2E    LEFT    JSR RSTORE      PRINT OLD CHAR
0033 0E37 301F              LEAX -1,X       BACKUP CURSOR
0034 0E39 2017              BRA CHECK       STILL ON SCREEN?

0035 0E3B BD0E2E    RIGHT   JSR RSTORE
0036 0E3E 3001              LEAX 1,X        MOVE RIGHT ONE SPACE
0037 0E40 2010              BRA CHECK

0038 0E42 BD0E2E    UP      JSR RSTORE
0039 0E45 3088E0            LEAX -32,X      MOVE UP A LINE
0040 0E48 2008              BRA CHECK

0041 0E4A BD0E2E    DOWN    JSR RSTORE
0042 0E4D 308820            LEAX 32,X       MOVE DOWN A LINE
0043 0E50 2000              BRA CHECK

                    ****************************
                    ***   SUBROUTINES TO KEEP
                    ***    CURSOR ON THE SCREEN
                    ***   VIDRAM = $0400 TO $0600
                    ****************************


0044 0E52 E684      CHECK   LDB ,X          GET OLD CHARACTER
0045 0E54 F70E00            STB CHAR        SAVE IT FOR NOW
0046 0E57 8C0400            CMPX #VIDRAM    LOWER THAN TOP?
0047 0E5A 2509              BLO OFFTOP      IF OFF TOP
0048 0E5C 8C05FF            CMPX #$5FF      HIGHER THAN BOTTOM?
0049 0E5F 240B              BHS OFFBOT      IF OFF BOTTOM
0050 0E61 9F88              STX CURSOR      IF ON SCREEN
0051 0E63 20A4              BRA GO

0052 0E65 8E0400    OFFTOP  LDX #$400       PUT CURSOR
0053 0E68 9F88              STX CURSOR      AT TOP LEFT CORNER
0054 0E6A 20BB              BRA SAVE        STORE CHR AT $400

0055 0E6C 8E05FF    OFFBOT  LDX #$5FF       PUT CURSOR
0056 0E6F 9F88              STX CURSOR      AT BOTTOM RIGHT
0057 0E71 16FFB3            LBRA SAVE       STORE CHR AT $5FF

                    ********  BREAK KEY PRESSED
                    ********  CONCLUDE PROGRAM
                    ******** RETURN TO BASIC

0058 0E74 7EA027    DONE    JMP BASIC       ALL DONE, GOTO BASIC
0059 0E77                   END START

NO ERRORS FOUND

BASIC  A027  CHAR   0E00  CHECK  0E52  CHROUT 0E20
CLS    A928  CURSOR 0088  DONE   0E74  DOWN   0E4A
GO     0E09  LEFT   0E34  OFFBOT 0E6C  OFFTOP 0E65
POLCAT A1B1  PRINT  A30A  RIGHT  0E3B  RSTORE 0E2E
SAVE   0E27  START  0E01  TOP    0E04  UP     0E42
VIDRAM 0400
```

END

Circle Reader Service card #196

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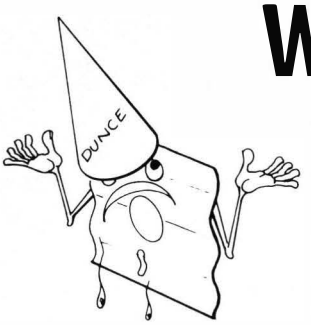

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Hot CoCo—May 1985
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The Learning Page

by Nancy Kipperman

CoCo Simulations

To prepare for this column, I explored the waters of Odell Lake in Oregon; traversed the woods of the northern United States; sold apples, plants, lemonade, and bicycles; wrestled with the U.S. Congress; and gained a new understanding of President Andrew Jackson. All this—and I never left the computer!

I gained these experiences using simulations for the CoCo: Market Place and Outdoor Biology (grades 2–9) prepared by Minnesota Educational Computing Consortium for Tandy Corporation and Congress and Presidential Decisions of Andrew Jackson (grades 9–12) from B5 Software (also available through Radio Shack's Express order Software).

These programs require a 32K Color Computer with Disk Extended Color Basic and a disk drive. (Congress is also available on cassette.) You can use each simulation on an individual basis, with a team of students, or as a class project.

Market Place

Market Place is designed for use within a social-studies curriculum and teaches economic concepts. It contains four simulations that increase in difficulty. An excellent course manual accompanies this software as do several reproducible student handouts and question sheets. Learning objectives are clearly stated for the teacher's benefit, and a section of text suggests possible uses in the classroom, including preparation and follow-up activities.

Sell Apples is the simplest simulation. The student becomes the apple seller and has to determine the best price at which to sell apples. Each time the program is run, a new best price is randomly set.

Sell Plants adds the concept of expenses and advertising to the selling situation. The student sells 1,000 tomato plants that the class has grown at a fixed expense of $30. Opportunities to purchase advertising at 25 cents a sign help the student to increase exposure and sales. Results demonstrate the relationship between selling price, advertising, and profit.

Sell Lemonade lets the student set up a lemonade-stand business. The student decides the quantity of lemonade to be produced, the price, and the number of advertising signs to purchase. Random events, such as changes in weather, street repair, and a parent's decision to stop providing free sugar, affect sales and profit.

Sell Bicycles is the most complicated of the Market Place simulations. Students manage two bicycle companies and learn how sales are affected by their business decisions.

Competition exists between the companies; each begins with $5,000 in cash and an inventory of 100 bicycles. The simulation continues until one company has earned $32,000 in assets or gone bankrupt. Students make decisions each quarter about production level, advertising budget, and selling price. Outcomes are affected by the other company's decisions and, eventually, by random events, such as fire, transportation and production strikes, wage-price freezes, and burglary.

Outdoor Biology

This simulation contains two programs to be used as part of a science curriculum (grades 2–9). Odell Lake simulates the feeding conditions for five kinds of fish in a North American lake; Odell Woods simulates the food chain that exists in North America's forests. Reproducible materials and course objectives are included in the package.

In Odell Lake, the student assumes the role of a specific kind of fish. The fish meets other kinds of fish and plant life in its natural environment. The survival of the fish depends on the student's decisions in each situation. Through experimentation (and often death), the student gains insight into food-chain relationships and ecological systems.

Odell Woods provides similar experiences, but the student assumes the role of an animal in the woods and makes survival decisions as that animal. In order to survive, the animal must eat enough to maintain its energy level and successfully live through a maximum of nine random encounters with unpredictable outcomes. Student teams are suggested as the best use of this simulation because decisions can be discussed and agreed upon.

Congress

Congress is a social-studies simulation in which you become the president of the United States. You build your program of five bills and then attempt to pass them through Congress within a two-year period. Congress might or might not have a majority of members of your chosen party affiliation. All bills begin in the House of Representatives; you must decide where to place your 20 lobbyists to effect the greatest good for your platform.

Flowcharts show the steps of a bill going through Congress. If the bill passes, you decide whether to veto the bill, sign it into law, or ignore it and let it become law. The number of amendments added to each bill during passage affects your point score; the simulation is different each time it is played. Again, student teams or pairs would work well with this program.

Andrew Jackson

Also a social-studies simulation, this program allows you to become President Andrew Jackson. Your challenge is to make the same decisions he did in each of several situations, such as the Indian removal from the South or the Eaton Scandal. To achieve this, you read a newspaper article displayed on the screen to obtain background information. In addition, you choose to reflect upon the past, view the overall effect of the problem, or ask advice from others—friends or cabinet members. These options can be used more than once before a decision must be made.

After you make your decision, it is compared to Jackson's. Then the final outcome and historical effects of Jackson's decision are explained. Finally, at the end of the simulation, your progress is rated with points and your effectiveness as Andrew Jackson stated.

In Conclusion

All these simulations have value in the classroom. Where they fit into your curriculum depends on you and the equipment and time available to you. Simulations such as these make it easy to set up a class project or competition. There is much to be learned by the practical application of knowledge or concepts; using simulations will no doubt add an element of interest and suspense to the learning process. ■

Nancy Kipperman is HOT CoCo's Education Editor and an English teacher at Conant High School in Jaffrey, NH. Write her c/o HOT CoCo, 80 Pine St., Peterborough, NH 03458.

Manufacturers and Products

B5 Software
1024 Bainbridge Place
Columbus, OH 43228
614-276-2752
- Congress: $29.95 (cassette) or $31.95 (disk)
- Presidential Decisions of Andrew Jackson: $31.95

Minnesota Educational Computing Consortium
3490 Lexington Avenue North
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Circle Reader Service card #209 on page 97.

Product News

by J. Scot Finnie

Polygon's Flight Check, D.P. Johnson's CCRD, Four Star's PenPal, OS9 Calligrapher, New Mark Data Games, the Latest from Dorsett, and More.

Information related in the Product News section is supplied by manufacturers. HOT CoCo has not tested or reviewed the products discussed here and cannot guarantee manufacturers' claims.

Specialized or vertical applications are a trend this month. More and more software and hardware companies are realizing that computer innovations that perform unusual or unique business, personal-productivity, or job-specific functions can quickly find their niche in the marketplace. Tailoring software to the needs of a small group of people (who will benefit substantially by an application designed to meet their needs only) makes sense because it offers the potential for the program to be efficient and easy to use. Such products can also provide "expert" information or a customized work environment to their audiences.

Specialized or Unusual

Polygon Industries is one of several companies that offers job-specific programs. **Flight Check** is an airplane-operation program that computes the best altitude and power settings for a given flight. It also computes weight, balance, and reserve fuel at destination. Barrett Leibe of Polygon noted that the program was "field" tested for 12 years in his airplane dealership business. Flight Check sells for $49. Polygon also offers **F & I Master**, a program designed to allow automobile dealers to work monthly payment terms on screen and print out 13 kinds of sales forms. It lets salesmen quickly discover the best financing for each customer. F & I Master sells for $2,000 but comes with extensive on-sight support, including customization for each dealer. These programs require 64K and at least one disk drive.

West Bay Company has released a new program called **Medic**, which it calls "one of the new generation of 'expert' programs." Medic appears to offer lay medical advice on common physical ailments—not what you might term expertise. It requires 16K, Extended Color Basic, and a disk drive. It sells for $20.

If you think specialized software is the latest rage, you haven't seen some of the unusual stuff being dreamed up out in CoCo land. Before **Sports**, the only exercises your computer offered were finger calisthenics or getting up to stretch your legs. Computhon could be on the verge of a new breakthrough in computer exercise. The Computhon Sports is a giant coil-spring-loaded joystick with a foot-operated fire button (see photo). You stand on it and move its handlebar with your body while watching and reacting to a game on your TV or monitor. The company markets the device as an exercise alternative and has tested the product for medical safety. The Sports plugs into one of the CoCo's joystick ports without modification. It sells for $150.

Sports from Computhon is a giant exercise joystick. The game pictured in the background is Skiing from Tandy Corp.

Advances

D.P. Johnson has a block buster of a new-product announcement this month. The company has released a 512K RAM-disk cartridge called **CCRD** (for Color Computer RAM disk). The CCRD plugs into a multiple ROM-pack interface and runs with OS-9. (The company also provides OS-9 drivers for customers who do not own OS-9.) The CCRD cartridge is a half-megabyte RAM disk that can be used by any program just like a disk drive. RAM disks can access software several times faster than mechanical disk drives because data is stored in RAM. RAM disks are especially useful for speeding up the compiling of C or Pascal programs. For larger memory, two CCRDs can be configured in one system to provide a megabyte of storage. The CCRD requires a multiple ROM-pack interface and OS-9 or OS-9 drivers you purchase separately from D.P. Johnson for $20. The cartridge sells for $298.

Four Star Software, makers of CoCo Paint and other fine programs, is being secretive about its new integrated business package dubbed **PenPal**. The product grew out of an idea for a flexible, creative database system, which Product News reported on in May. PenPal is sure to include a word processor, spreadsheet, and database. The company intends to release the new product before the end of the year. We'll just have to wait and see.

Soistmann Enterprises can't resist saying "help has arrived." The company offers a new DOS called **S.O.S.** (for small operating system). S.O.S. requires a 64K Color Computer and is designed for machine-language programs. It does not support Basic. The DOS was designed to provide a larger work space and several improvements for program developers. Its format, backup, and copy utilities are designed to work with 35-, 40-, or 80-track single- or double-sided disk drives. The new DOS offers a long list of intriguing options and features. This might be just what you are looking for. Contact the company for more information. S.O.S. sells for $49.95.

News Bits

PBJ of Word-Pak fame has a new address and phone number: P.O. Box 813, 5725 Kennedy Blvd., N. Bergen, NJ 07047, 201-861-0126. The company is working on a new version of the OS-9 driver for Word-Pak that will enhance the product's use with other products, such as Computer Systems Center's Dyna-Calc for OS-9 being marketed by Tandy. PBJ is also quickly becoming the *de facto* standard in multifunction add-on boards for the Tandy 1000. New 1000 boards in the works from PBJ include a 2-megabyte board, a high-resolution board, and the "Super Charger," which contains the 80126 chip (the same one used in the Tandy 2000).

The CoCo Calligrapher from Sugar Software has been released in a new version for OS-9 called **OS9 Calligrapher**. The program is a special-purpose text processor that reads an input file containing both text and format

ting directions. Text is output to a dot-matrix printer or redirected to a file in one of many available print styles. OS9 Calligrapher supports Epson, Gemini, Tandy, Okidata, Leading Edge Banana, and C. Itoh Prowriter dot-matrix printers and their compatibles. It sells for $39.95 plus $1.50 for shipping. Sugar Software headed south a few months back. They now have a new phone number to go along with their new Hollywood, FL address: 305-981-1241.

Games and Education

Shock Trooper and **The Vortex Factor** are two new games from Mark Data Products. Shock Trooper is an arcade game with a theme resembling the movie *V*, in which scheming reptilian creatures descend to earth and plot to take over. The Vortex Factor is the sixth in Mark Data's series of graphics adventures and is about time travel. Both programs require 32K and come on cassette for $24.95 or disk for $27.95 plus $2 for shipping.

Dorsett Educational Systems is working on disk versions of some of its popular educational series. Its latest conversion is **Disk Algebra**. The company is also releasing two new series: **Principles of Electricity** and **Lower Math**. The latter is designed for kindergarten through fourth-grade learners. Dorsett's educational series contain 16 lessons, require 16K, and sell for $59.95. ■

List of Vendors

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Four Star Software
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L5M 2C2, Canada
416-858-7827
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D.P. Johnson
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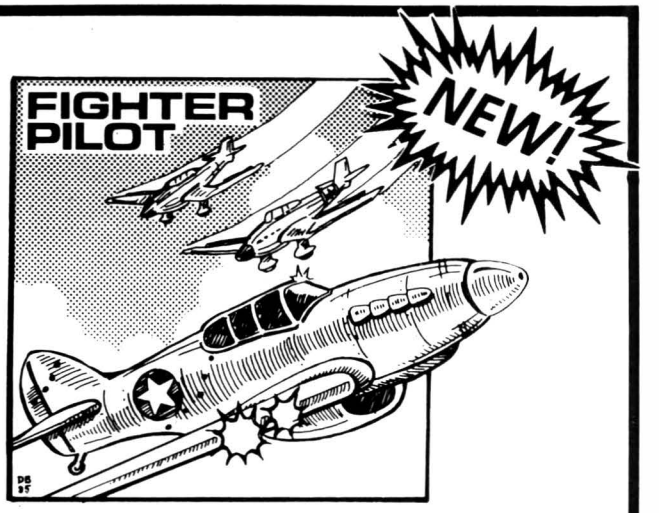

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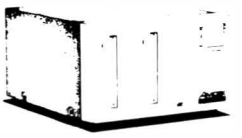

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by Jeff Stevens

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by John Ashurst

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The Corner Office

by Jeff DeTray, Publisher

The Piracy Issue

"What is software piracy?" That's what an anonymous 9-year-old *HOT CoCo* reader asked me in a recent letter. "Am I doing something that's wrong? Please write a column about piracy." My correspondent went on to describe how he copies and swaps programs with friends and with members of his computer club. He had been reading articles about software piracy in computer magazines. He knew piracy was considered a bad thing, but he wasn't quite sure what piracy was. Clearly, it had just occurred to our young friend that his copying and swapping activities might actually be wrong. He was suffering his first pangs of guilt about an activity which seemed perfectly okay to him, but which he now learned was illegal.

The letter bothered me. There's something sad about a system that makes 9-year-olds feel like criminals. And yet, there's no denying that the uncontrolled copying and swapping of software hurts everyone—manufacturers and users alike. It's an issue unlike any society has ever faced, because we have never before possessed a technology that allows such easy duplication of a valuable information product. If it were as easy and inexpensive to duplicate a book as it is to duplicate a piece of software, how many books do you think would be sold? With books, it's far more economical to buy your own copy.

It's unfair, really. My letter writer wasn't trying to rip off anyone, merely help out his friends and save himself a few dollars. I wonder, though, why no adult ever explained to him what program swapping really means. It may not be true in every market for every computer, but when it comes to the Color Computer, unauthorized copying really hurts. Even though it may not be as out-of-control as some people think, the problem is large enough to discourage some software makers from producing new CoCo products. The end result is fewer programs plus a trend toward copy-protection, a real pain for users.

EOS Notes

Thanks for your numerous letters about using Tandy's Express Order Software system. If there is any consensus to be drawn, it is that EOS is a good idea with great potential and a few serious bugs.

Most everyone trying the system says that, while it works and the software they've ordered eventually arrives, they are not sure they'll use the system again. First, too many Tandy store personnel still don't seem to know or care a great deal about EOS. But more important is the lack of demonstration copies or even a descriptive catalog of the programs available. If you're going to order sight unseen anyway, there's slight advantage in ordering through EOS. The delivery time doesn't time appear to be significantly faster than a good mail-order vendor.

Demo copies and a good catalog could make EOS take off like a rocket.

As always, your letters are welcome at:

Jeff DeTray
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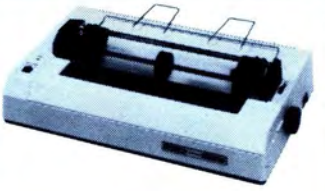

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Only $79.95, the HJL-57 is available for immediate shipment for either the original Color Computer (sold prior to October, 1982) or the F-version and TDP-100 (introduced in October, 1982), and the new 64K CoCo. **Now also available for CoCo 2.**

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Ordering Information: Specify model (Original, F-version, or CoCo 2). Payment by C.O.D., check, MasterCard or Visa . Credit card customers include complete card number and expiration date. Add $2.00 for shipping ($3.50 for Canada). New York state residents add 7% sales tax.
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